Ex biblioth. G. J. Franckii.

Princeps huj. operis editio a. 1614. Antecessit hanc editionem Scheiblero auct. (fuit. in dii may. [illegible] [illegible] St. 7 p 12) antecessit ed. anni 1619. Hujus nostrae ex Frobesio mentionem facis [illegible] l. op. pag. Scheiblerus.

LOGARITHMORVM CANONIS DESCRIPTIO,

SEV

ARITHMETICARVM SVPPVTATIONVM MIRABILIS ABBREVIATIO.

Eiusque vsus in vtraque Trigonometria *vt etiam in omni* Logistica Mathematica, *amplissimi, facillimi & expeditissimi explicatio.*

Authore ac Inuentore IOANNE NEPERO, Barone Merchistonij, &c. SCOTO.

LVGDVNI,

Apud Barth. Vincentium.

M. DC. XX.

Cum Priuilegio Cæsar. Majest. & Christ. Galliarum Regis.

Illustrissimo, & optimæ spei

PRINCIPI CAROLO,

POTENTISSIMI, ET INVICTISSIMI,

IACOBI D. G.

MAGNÆ BRITANNIÆ,
ET HIBERNIÆ REGIS,

Filio vnico, VValliæ Principi, Duci Eboraci, & Rothesaiæ, magno Scotiæ Senescallo, ac Insularum Domino, &c.

D. D. D.

QVVM *nullum sit studium, vel doctrinæ genus* (Illustrissime Princeps) *quod generosa ac heroïca ingenia, ad præclara quæque & sublimia magis acuat, contráque tarda & insulsa pectora magis obtundat, quàm mathesis: non mirandum est eruditos & magnanimos Principes eam magnoperè præteritis omnibus seculis in deliciis habuisse, imperitos vero & ignauos homines eandem velut ignorantiæ suæ & ignauiæ hostem,*

ſemper odio acerrimo proſequutos eſſe. Cur non igitur nouitium hoc noſtrum inuentum, cùm obtuſa ingenia & humi repentia refugiat, ad ſublime Celſitudinis tuæ ingenium & patrocinium confugiet & tranſuolabit? Præſertim cùm noua hæc Logarithmorum methodus, omnem illam priſtinæ Matheſeos in calculo difficultatem (quæ alioqui generoſam tuam indolem offendere poſſet) penitus è medio tollat: & ad ſubleuandam memoriæ imbecillitatem ita ſe accommodet, vt illius adminiculo facile ſit, plures quæſtiones mathematicas vnius horæ ſpatio, quàm priſtinâ & communiter receptâ formâ ſinuum, tangentium, & ſecantium, vel integro die abſoluere. Ideoque tuæ Celſitudini tantò gratius hoc inuentum fore ſperamus, quantò facilem magis & expeditam reddit Logiſticam: quid enim iucundius, & in omni diſciplinarum genere præſtantius eſſe poßit, quàm præclara quæque & ſublimia, exactè, ex tempore, facili negotio, nulloque vel temporis vel laboris diſpendio expedire? Rogamus igitur (Sereniſſime Princeps) *vt munuſculum hoc, licet exiguum, & longe infra meritorum & dignitatis tuæ faſtigium, certißimi tamen obſequij pignus & ſymbolum, pro humanitate tua boni conſulas. Quodſi te feciſſe intellexero, vel hac ſola ratione animos mihi jam morbis penè confecto addideris, ad alia propediem, his fortaſſe majora & tanto principe magè digna moliendum. Interim illuſtrißimos tuos parentes magna magnæ* BRITANNIAE *luminaria, teque præclarum tam præclaræ ſtirpis ramum, & futuræ noſtræ tranquillitatis ſpem, diu nobis incolumes ſeruet & protegat ſummus ille Rex Regum, & Dominus dominantium, cui omnis honor & gloria in æternum tribuatur.*

Sereniſſimæ tuæ Celſitudinis obſequio
addictiſſimus
IOANNES NEPERVS.

PRÆFATIO.

QVVM nihil sit (charissimi mathematum cultores) mathematicæ praxi tam molestum, quodque Logistas magis remoretur, ac retardet, quàm magnorum numerorum multiplicationes, partitiones, quadratæque ac cubicæ extractiones, quæ præter prolixitatis tædium, lubricis etiam erroribus plurimùm sunt obnoxiæ: Cœpi igitur animo reuoluere, quâ arte certâ & expedita, possem dicta impedimenta amoliri. Multis subinde in hunc finem perpensis, nonnulla tandem inueni præclara compendia alibi fortasse tractanda: verùm inter omnia nullum hoc vtilius, quod vnà cum multiplicationibus partitionibus, & radicum extractionibus arduis & prolixis, ipsos etiam numeros multiplicandos, diuidendos, & in radices resoluendos ab opere reiicit, & eorum loco alios substituit numeros, qui illorum munere fungantur per solas additiones, substractiones, bipartitiones & tripartitiones. Quod quidem arcanum, cùm (vt cætera bona) sit, quo communius, eo melius: in publicum mathematicorum vsum propalare libuit. Eo itaque liberè fruamini (matheseos studiosi) & quâ à me profectum est beneuolentiâ, accipite. Valete.

Ad

AD LECTOREM TRIGONOMETRIÆ studiosum.

QVi Cœli, atque ſoli, & ſinuoſos æquoris arcus
Metiri, & curuos vis numerare gradus;
Quíque per expanſum tenſas cognoſcere rectas,
Menſurat radio quas GEODÆTA ſuo:
Macte aĩo, inſta operi, LOGARITHMIS vtere, quos hîc
Rara Caledonij, dat Baro, gemma ſoli.
Fruſtrâ erit hinc multis tabulas extendere chartis:
Fruſtrà erit & calamo crebra litura tuo.
Quæ niſi multiplici nunquam potuere priores,
Actu vno hîc facili tu numerare queas.
Ad SOPHIAM quid ferto noui, quod priſtina vincat,
Quiſquis ab ingenio nomen habere cupis.

PATRICIVS SANDÆVS.

IN

IN LOGARITHMOS D. I. NEPERI.

REgiomontanus fertur per aphæræsim, atque
 Prosthesin ignotos elicuisse sinus:
Atque aliquos aliquot sinuum quæsita Logistas
 Consimili legimus notificasse modo:
Nmo tamen cunctos poterat sic soluere nodos,
 Aut certâ rectam lege docere viam.
Musarum NEPERVS honos, & gloria gentis
 Scotigenæ, paruo præstat vtrumque libro.
Nomine sic NEPAR, PARILI fit & omine NON PAR,
 Quum non hac habeat NEPAR in arte PAREM.

ALIVD.

BVCHANANE tibi NEPERVM adscisce sodalem,
 Floreat & nostris *Scotia* nostra viris:
Nam velut ad summum culmen perducta Poësis
 In te stat, nec quò progrediatur habet:
Sic etiam ad summum est culmen perducta Mathesis,
 Inque hoc stat, nec quò progrediatur habet.

ANDREAS IVNIVS.

Philosophiæ Professor in Academia Edimburgena.

IDEM AVTHOR AD LECTOREM.

HIc liber est minimus, si spectes verba, sed vsum
Si spectes, Lector, maximus hic liber est.
Disce, scies paruo tantum debere libello
Te, quantum magnis mille voluminibus.

ANDREAS IVNIVS.

Philosophiæ Professor in Academia Edimburgena.

IN LOGARITHMOS.

QVæ tibi cunque sinus, tangentes atque secantes
Prolixo præstant, atque labore graui:
Absque labore graui, & subitò tibi, Candide Lector,
Hæc Logarithmorum parua tabella dabit.

MIRI

MIRIFICI LOGARITHMORVM CANONIS DESCRIPTIO,

EIVSQVE VSVS IN VTRAQVE TRIGOnometria, vt etiam in omni Logiſtica Mathematica, ampliſſimi, facillimi, & expeditiſſimi explicatio.

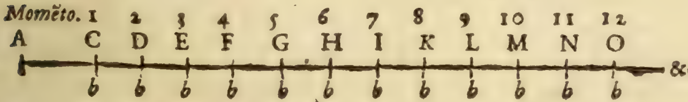
LIBER PRIMVS.

DE DEFINITIONIBVS.

CAP. I.

Definitio 1.

LINEA æqualiter creſcere dicitur, quum punctus eam deſcribens, æqualibus momentis per æqualia interualla progreditur.



Sit punctus A, à quo ducenda ſit linea fluxu alterius puncti, qui ſit B. fluat ergo primo momento B ab A in C. Secundo momento à C in D. Tertio momento à D in E. atque ita deinceps in infinitum deſcribendo lineam A C D E F, &c.

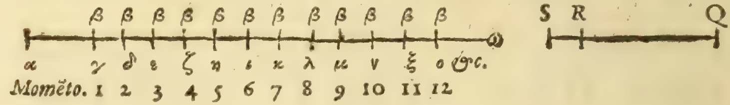
interuallis A C, C D, D E, EF, & cæteris deinceps æqualibus, & momentis æqualibus deſcriptis: dicetur hæc linea per definitionem ſuperius traditam æqualiter creſcere.

Corollarium.

Vnde hoc incremento quantitates æquidifferentes temporibus æquidifferentibus produci eſt neceſſe.

Vt in ſuperiori ſchemate vnico momento B ab A in C, & tribus momentis ab A in E progreſſum eſt. Sic ſex momentis ab A in H, & octo momentis ab A in K. Sunt autem illorum momentorum vnius & trium, & horum ſex & octo differentiæ æquales, ſcilicet duorum. Sic etiam erunt quantitatum illarum A C, & A E, & harum A H, & A K differentiæ C E, & H K, æquales: æqui differentes ergo, vt ſupra.

2. *Linea proportionaliter in breuiorem decreſcere dicitur, quum punctus eam tranſcurrens, æqualibus momentis ſegmēta abſcindit einſdem continuò rationis ad lineas à quibus abſcinduntur.*



Exempli gratia.

Sit linea ſinus totius $\alpha\omega$ proportionaliter minuenda. Sit punctus tranſcurſu ſuo eam minuens β. Sit denique ratio ſegmentorum ſingulorum ad lineas à quibus abſcinduntur, vt Q. R ad Q. S. Quâ ergo ratione ſecatur Q. S. in R. eadem ratione (per 10. 6. Eucl.) ſecetur $\alpha.\omega$ in γ. atque ſic β. tráſcurrens ab α in γ primo momento ab $\alpha.\omega$ abſcindat $\alpha.\gamma$. relicta linea ſeu ſinu $\gamma.\omega$. Ab hac autem $\gamma.\omega$ procedens β ſecundo momento abſcindat ſimile ſegmentum quale eſt Q. R ad Q. S. quod ſit $\gamma\,\delta$, relicto ſinu $\delta.\omega$. A quo proinde tertio momento abſcindat β ſimili ratione ſegmentum $\delta.\varepsilon$. relicto ſinu $\varepsilon.\omega$. A quo ſimiliter quarto momento abſcindatur (fluxu β) ſegmentum $\varepsilon\,\zeta$, relicto ſinu $\zeta.\omega$. Ab hoc $\zeta.\omega$, quinto momento abſcindat β eadem ratione ſegmentum $\zeta\,\eta$, relicto ſinu $\eta.\omega$. Et ita deinceps, in infinitum. Dico itaque hic ſinus totius lineam $\alpha.\omega$ (ex præmiſſa definitione) proportionaliter decreſ

decrescere in sinum $\eta\omega$. aut in alium quemuis vltimum in quo sistit β & sic in aliis.

Corollarium.

Vnde hoc æqualibus momentis decremento, eiusdem etiam rationis proportionales lineas relinqui est necesse.

Quæ enim superius est continua proportio sinuum minuendorum, $\alpha\omega, \gamma\omega, \delta\omega, \epsilon\omega, \zeta\omega, \eta\omega. \iota\omega, \& \kappa\omega$, &c. atque segmentorum ab eis abscissorum $\alpha\gamma, \gamma\delta, \delta\epsilon, \epsilon\zeta, \zeta\eta, \eta\iota, \iota\kappa, \& \kappa\lambda$. Eadem erit necessario etiam sinuum relictorum proportio, scilicet, $\gamma\omega, \delta\omega, \epsilon\omega, \zeta\omega, \eta\omega, \iota\omega, \kappa\omega, \& \lambda\omega$. vt ex 19. prop. 5. & 11. prop. 7. Eucl. patet.

3. *Quantitates surdæ, seu numero inexplicabiles, numeris quàm proximè definiri dicuntur, quum numeris maiusculis, qui à veris surdarum valoribus vnitate non differant, definiuntur.*

Vt sit semi-diameter seu sinus totus rationalis numerus 10000000. erit sinus 45. graduum radix quadrata 200000000000000. quæ surda seu irrationalis & numero inexplicabilis est, atque inter terminos 7071067. minorem, & 7071068. maiorem includitur. Ab horum itaque vtrouis non differt vnitate. Surdus igitur sinus ille 45. graduum quàm proximè dicitur definiri & explicari, quum per numeros integros 7071067 vel 7071068. neglectis fractionibus definitur. In magnis etenim numeris ex fragmentis vnitatis spretis nullus error sensibilis emergit.

4. *Synchroni motus sunt, qui simul & eodem tempore fiunt.*

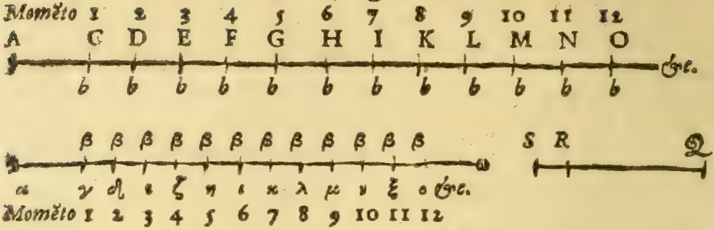
Vt in superioribus esto quod B. moueatur ab A in C. eodem tempore quo β. mouetur ab α. in γ. dicentur rectæ A C, & $\alpha\gamma$ synchrono motu describi.

Definitio & Postulatio.

5. *Quum quolibet motu & tardior & velocior dari possit, sequetur necessariò cuique motui æquiuelocem (quem nec tardiorem, nec velociorem definimus) dari posse.*

6. *Logarithmus ergò cuiusque sinus, est numerus quem proximè definiens lineam, quæ æqualiter creuitintereà dum sinus totius linea proportionaliter in sinum illum decreuit, existente vtroque motu synchrono, atque initio æquiueloce.* quám

Exempli gratia.



Repetantur ambo ſuperiora ſchemata & moueatur B. ſemper & vbique eadem ſeu æquali velocitate qua cœpit moueri β initio quum eſt in α. deinde primo momento procedat B. ab A in C, & eodem momento procedat β ab α in γ proportionaliter: erit numerus definiens A C logarithmus lineæ, ſeu ſinus γ ω. Tum ſecundo momento promoueatur B à C in D, & eodem momento promoueatur proportionaliter β à γ in δ. erit numerus definiens A D logarithmus ſinus δ ω. Sic tertio momento procedat æqualiter B à D in E, & eodem momento promoueatur proportionaliter β à δ in ε, erit numerus definiens A E logarithmus ipſius ſinus ε ω. Item quarto momento procedat B in F, & β in ζ, erit numerus A F logarithmus ſinus ζ ω. Atque eodem continuò ſeruato ordine erit (ex definitione ſuperius tradita) numerus A G logarithmus ſinus η ω. A H logarithmus ſinus ι ω. A I logarith. ſinus K ω. A K logarith. ſinus λ ω. & ita in infinitum.

Corollarium.

Vnde ſinus totius 10000000. *nullũ ſeu* 0 *eſt logarithmus: & per conſequẽs, numerorũ maiorũ ſinu toto logarith. ſunt nihilo minores.*

Quum enim ex definitione pateat, quod à ſinu toto decreſcentibus ſinibus, à nihilo accreſcant logarithmi, ideò contrà creſcentibus numeris (quos adhuc ſinus vocamus) in ſinum totum, ſcilicet in 10000000. decreſcant, in 0, ſeu nihilum logarithmi eſt neceſſe. Et per conſequens numerorum creſcentium vltra ſinum totum 10000000. (quos ſecantes aut tangentes, & non amplius ſinus vocamus) logarithmi erunt minores nihilo.

Itaque

Itaque logarithmos sinuum, qui semper maiores nihilo sunt, abundantes vocamus, & hoc signo †, aut nullo pranotamus. Logarithmos autem minores nihilo, defectiuos vocamus, pranotantes eis hoc sinum.———

ADMONITIO.

ERat quidem initio liberum cuilibet ſinui, aut quantitati nullum ſeu o, pro logarithmo attribuiſſe: ſed præſtat id præ cæteris ſinui toti accommodaſſe: ne vnquam in poſterum vel minimam moleſtiam parturiret nobis additio & ſubſtractio eius logarithmi in omni calculo frequentiſſimi. Cæterùm etiam quia ſinuum & numerorum ſinu toto minorum frequentior eſt vſus: eorum igitur logarithmos abundantes ponimus: aliorum verò defectiuos, etſi contrà feciſſe initio liberum erat.

DE LOGARITHMORVM propoſitionibus.

CAP. II.

Propoſitio 1.

P*Roportionalium numerorum, aut quantitatum, æqui-differentes ſunt Logarithmi.*

Vt proportionalium ſinuum, ſcilicet γω qui ſe habet ad εω, vt ιω ad λω, Logarithmi reſpectiuè ſunt numeri definientes A C, A E, A H, & A K, (vt per def. 6. patet.) differunt autem A C, & A E differentia C E: atque AH, & A K differentia H K. Sunt autem ex 1. def. & ſuo corollario C E, & H K æquales: æqui-differentes igitur ſunt logarithmi præfatorum ſinuũ proportionalium. Et ita in omnibus proportionalibus.

Nam quas affectiones & ſymptomata Logarithmi ab ortu & geneſi ſua acquiſiuerint, eas impoſterum retineãt, eſt neceſſe. Ab ortu autem & in geneſi ſua imbuuntur hac affectione, & hæc lex illis præſcribitur, vt ſint æqui-differentes, quum

eorum sinus seu quantitates sint proportionales (prout ex def. Logarithmi, & vtriusque motus patet, & in constructione logarithmorum amplius aliquando patebit,) proportionalium ergo quantitatum æqui-differentes sunt Logarithmi.

2. *Ex trium proportionalium Logarithmis, duplum secundi seu medij minutum primo, æquatur tertio.* + 4 el. 5 cap. 2 ar. P. R.

Quum, per prop. 1. differentia logarithmorum primi & secundi æquetur differentiæ logarithmorum secundi & tertij, id est, secundus minutus primo, æquetur tertio minus secundo: Ideo addito secundo ad vtrumque æquationis latus proueniet bis secundus seu duplum secundi minutum primo æquale tertio, quod erat probandum.

3. *Ex trium proportionalium logarithmis, duplum secundi seu medij æquatur aggregato extremorum,* + 4 el. 5 cap. 2 ar. P. R.

Ex præcedente prop. 2. duplum secundi minutum primo æquatur tertio. Vtrique æqualium laterum adde primum, & exurget duplum secundi æquale primo & tertio, id est, aggregato extremorum, quod erat demonstrandum. /sc: Logarith.

4. *Ex quatuor proportionalium logarithmis, aggregatum secundi & tertij minutum primo æquatur quarto.*

Quum per 1. prop. ex quatuor proportionalium logarithmis, secundus minutus primo, æquetur quarto minus tertio, vtrique æqualitatis lateri, adde tertium, & fient secundus & tertius minuti primo æquales quarto, quod erat propositum.

+ 2 el. 5 cap. 2 lib. ar. P. R.

5. *Ex quatuor proportionalium logarithmis aggregatum mediorum (secundi, scilicet, & tertij) æquatur aggregato extremorum, primi videlicet, & quarti.*

Per prop. 4. præcedentem, secundus & tertius minuti primo erant æquales quarto: vtrique æqualitatis lateri adde primum, & fiet secundus, plus tertio æqualis quarto, plus primo, quod demonstrandum erat.

6. *Ex quatuor continuè proportionalium logarithmis triplum alterutrius mediorũ æquatur aggregato extremi remoti, & dupli vicini.*

Per secundam prop. duplum secundi seu medij minutum primo est æquale tertio: & per tertiam prop. duplum, huius, quod est, quadruplum secundi minutum duplo primi, æquabitur aggregato suorum extremorum, videlicet quarto plus secundo.

cundo. Iam ſi ab vtroque æqualitatis latere ſubduxeris ſecundum, fiet triplum ſecundi minutum duplo primi æquale quarto: huius rurſus æqualitatis lateribus adde duplum primi, & exurget triplum ſecundi æquale quarto plus primi duplo: quod probandum ſuſcepimus.

ADMONITIO.

HVc vſque logarithmorum geneſin & ſymptomata explicauimus: quo verò calculo, quaue logiſticæ methodo habeantur, hoc loco explicandum foret. Sed quia ipſum canonem integrum, eiuſque logarithmos omnes cum ſuis ſinibus ad ſingulas quadrantis minutias primas exhibemus, ideo in tempus magis idoneum doctrinam conſtructionis logarithmorum tranſilientes, ad eorum vſum properamus, vt prælibatis prius vſu, & rei vtilitate, cætera aut magis placeant poſt hac edenda, aut minus ſaltem diſpliceant ſilentio ſepulta. Præſtolor enim eruditorum de his iudicium & cenſuram, priuſquam cætera in lucem temerè prolata liuidorum detractationi exponantur.

DESCRIPTIONEM COMPLECTENS tabulæ logarithmorum, & ſeptem eius columnarum.

CAP. III.

Sectio I.

PRima columna eſt expreſsè arcuum ab 0. *in* 45. *Grad. creſcentium: & ſubintelligitur eſſe etiam ſuorum ad ſemicirculum reliquorum.*

2. *Septima autem columna eſt arcuum à quadrante in* 45. *gradum decreſcentium: & ſubintelligitur eſſe etiam ſuorum ad ſemicirculum reliquorum.*

3. *Vnde alterius columnæ arcus, ſunt arcuum alterius è regione reſpondentium complementa.*

4. *Atque*

4. *Atque in prima exprimitur omnis trianguli rectilinei rectanguli angulus acutus minor.*

5. *In septima autem ei è regione collocatur eiusdem rectanguli angulus acutus minor.*

major.

6. *In secunda columna sunt sinus arcuum primæ columnæ.*

7. *Suntque hi crus minus subtendens minorem angulum rectanguli, cuius basis, seu hypotenusa est sinus totus.*

8. *In sexta columna sunt sinus arcuum septimæ columnæ.*

9. *Suntque hi crus maius subtendens maiorem angulum eiusdem rectanguli, cuius scilicet hypotenusa est sinus totus.*

10. *Vnde omni triangulo rectilineo rectangulo fit æquiangulum & simile ex sinu toto, & sinu secundæ columnæ, & sinu sextæ ei è regione respondente.*

11. *Tertia columna continet Logarithmos arcuum, & sinuum sinistrorum.*

12. *Qui sunt* Logarithmi *proportionis cruris minoris rectanguli ad eiusdem hypotenusam.*

13. *Itemque hi sunt arcuum, & sinuum dextrorum Logarithmi complementorum, quos antilogarithmos appellamus.*

14. *Quinta columna continet* Logarithmos *arcuum, & sinuum dextrorum.*

15. *Qui sunt logarithmi proportionis cruris maioris rectanguli ad eiusdem hypotenusam.*

16. *Itemque hi sunt arcuum & sinuum sinistrorum antilogarithmi, seu logarithmi complementorum.*

17. *Quarta denique seu media columna continet differentias inter logarithmos tertiæ columnæ, & quintæ. Vnde duplex est hæc columna, Abundans & defectiua.*

18. *Abundantes, sunt differentiæ, quæ oriuntur ex substractione logarithmorum quintæ à logarithmis tertiæ.*

19. *Defectiuę verò, sunt differentiæ ortæ ex subductione logarithmorum tertiæ à logarithmis quintæ: quæ ideo sunt minores nihilo.*

20. *Differentiæ abundantes dicuntur differentiales numeri, arcuum sinistrorum.*

21. *Suntque logarithmi proportionis minoris cruris rectanguli ad eiusdem crus maius.*

22 *Item*

22. *Itemque sunt* Logarithmi *fæcundorum, siue tangentium arcuum sinistrorum.*

23. *Differentiæ autem defectiuæ dicuntur numeri differentiales, arcuum dextrorum.*

24. *Suntque* Logarithmi *proportionis maioris cruris rectanguli ad eiusdem crus minus.*

25. *Itemque sunt Logarithmi fæcundorum, siue tangentium arcuum dextrorum.*

26. *Omnis etiam arcus sinister, eiusque ad semicirculum reliquus, dicitur arcus complementi arcuum, sinuum, & Logarithmorum dextrorum, atque differentialium defectiuorum.*

27. *Et contra, omnis arcus dexter, eiusque ad semicirculum reliquus, dicitur arcus complementi arcuum, sinuum, & Logarithmorum sinistrorum, atque differentialium abundantium.*

ADMONITIONES.

28. *Hic notandum est, si Logarithmos tertiæ columnæ defectiuos feceris (præposito scilicet — signo,) fient Logarithmi hypotenusarum, siue secantium arcuum dextrorum septimæ columnæ.*

29. *Et hi etiam fient* Logarithmi *proportionis hypotenusæ rectanguli ad eiusdem crus minus.*

30. *Et si* Logarithmos *quintæ columnæ defectiuos feceris, fient* Logarithmi *hypotenusarum, siue secantium arcuum sinistrorum primæ columnæ.*

31. *Fient etiam hi* Logarithmi *proportionis hypotenusæ rectanguli ad eiusdem crus maius. Verùm quia ad rectilineorum scientiam comparandam, soli sinus, eorumque arcus, & logarithmi cum differentialibus: ad Sphæricorum autem, spretis sinibus, soli arcus, & eorum logarithmi, & differentiales sufficiunt: ideo hypotenusas & fæcundos tabula exclusimus: sicuti & sinus ipsos in sphæricis negligi volumus, Ostendemus tamen obiter te posse (si libuerit) eis omnibus satis expeditè in rectilineis vti, in sphericis verò minimè.*

DE VSV TABVLÆ ET NVMERORVM EIVS.

CAP. IV.

Sectio I.

Sinuum, tangentium, & secantium præcisè in tabulis suis repertorum, Logarithmos non minus præcisè dare.

Per sect. 11, & 14. cap. 3. reperto sinu dato in secunda, aut septima columna nostræ tabulæ, reperietur eius Logarithmus in eiusdem lineæ tertia vel quinta columna. Habentur igitur sic exactè sinuum tabulatorum logarithmi. Tangentium autem & secantium numeris in suis tabulis repertis habentur arcus. Ex arcubus verò cognitis nostra tabula exhibet tangentium logarithmos seu differentiales cum signis suis in media columna per sect. 22. & 25. Et secantium logarithmos reciprocè in tertia & quinta columna, præposito tamen his — signo per sect. 28. & 30. Habentur igitur sinuum, tangentium, & secantium tabulatorum logarithmi.

Exempla sinuum.

Sinus 6946584. Logarithmum quæro. Sinum illum præcisè reperio in secunda columna respondentem arcui 44. Gr. o. m. & in eadem linea tertiæ columnæ adstat illi 3643349. suus logarithmus, quem quæsiui. Item sinus 7213574 quæratur logarithmus. Sinus hic inuenietur respondens arcui 46. Gr. 10. m. & ei vicinus 3266204. logarithmus eius quæsitus.

Exempla tangentium.

Quæratur tangentis 2186448. logarithmus. Huic tangenti in sua tabula respondet arcus 12. Gr. 20. m. & huic arcui in media columna tabulæ nostræ respondet logarithmus, seu differentialis abundans 15203064. quæsitus. Item si tangentis 45736291. logarithmum quæsiueris, offendes in tabula tangentium eius arcum 77. Gr. 40. m. huiusque arcus in tabula nostra differentialem eandem, defectiuam tamen, scilicet — 15203064.

Exem-

Exempla secantium.

SEcanti 18118009. respondet in tabula secantium arcus 56. Gr. 30. m. & huic arcui in tabula nostra conuenit reciprocè defectiuus —— 5943212. logarithmus secantis 18118009. suprascripti. Sic secantis 13118337. inuenies logarithmum —— 2714255. & secantis 13960591. offendes logarithmum —— 3336533.

2. *Numerorum datorum, & in tabulis sinuum, tangentium, & secantium non repertorum, logarithmos æstimare.*

Numerum dato simillimum, siue is fuerit dati decuplus, centuplus, millecuplus, 10000plus, 100000plus, aut 1000000plus, quære in secunda, aut sexta columna tabulæ nostræ, aut si mauis, in tabulis tangentium, aut secantium: & huius arcum nota: eius enim logarithmus è tabula nostra elicitus, est quem quæris: mente tamen reseruando, aut memoriæ gratiâ notis exprimendo numerum locorum, seu figurarum multiplicitatis. Vt si quæratur logarithmus numeri 137. in tabulis non reperti: reperies inter sinus numeros 14544.136714.& 1371564.& inter tangentes 13705046. inter secantes verò numerum 13703048, qui est omnium dato simillimus, dummodò eius vltimæ vel dextimæ quinque figuræ deleri subintelligantur: huius ergo secantis 13703048.& sui arcus 43.Gr.8.m. logarithmus (per præced. aut per sect. 28.& 30. cap. 3.) quæratur, & inuenietur —3150332. qui pro logarithmo dati numeri 137. etiam habetur: recordando tamen vltimas quinque figuras abscindendas esse, aut memoriæ gratia expressè hoc modo signandas —— 3150332. —— 00000. Similiter si per tangentem 13705046. superiùs expressum quæsiueris logarithmum numeri 137. ex tangentis illius arcu 53. Gr. 53.m. inuenietur (per sect. 25.) in media columna —— 3151790. logarithmus illius tangentis 13705046. qui quia excedit 137. datum quinque locis seu figuris, ideo —— 3151790. —— 00000. erit logarithmus numeri dati 137. Tanto tamen minus exactus est hic logarithmus, quanto magis 13705046. est dissimilis numero 13700000. seu centies millecuplo dati: sed hic error partes $\frac{5046}{100000}$ unitatis

non exuperat. Si tandem per sinum suprascriptum 1371564. quæsiueris logarithmum dati 137.is (per hanc, & 11.sect.cap.3.) deprehendetur esse 19866327—0000. Nec secus operandum erit signo † quando numerus figurarum datæ quantitatis excedit numerum figurarum sinus ei simillimi, quod rarò contingit: vt, si quæratur numeri seu discretæ quantitatis 232702. logarithmus, inuenies in tabula sinum 23271. ei omnium simillimum, sed vnica deest huic figura. Huius ergo logarithmo tabulato (per sect.11.cap.3.) reperto, qui est 60631284. adiiciatur vnica cyphra signo † interposito, & fiet 60631284†0. pro logarithmo numeri 232702. quæsito. Sed modus logarithmos æstimandi omnium optimus est, quo primò creati sunt: de quo alibi.

3. *Vnde vt superiore prima sectione logarithmi simplices, & puri exhibentur: ita hac præcedente appositis cyphris impuri emergunt.*

4. *Similium signorum logarithmos addere, est aggregatum vtriusque cum signo communi exhibere.*

Vt ex additione — 56312. ad — 73495. prouenient — 129807. Itemque addito 4216. ad † 5392. producuntur 9608. Sic 3219 — 00. ad 4360 — 000. faciunt 7579 — 00000.

5. *Dissimilium signorum logarithmos addere, est differentiam eorum cum signo maioris numeri exhibere.*

Vt ex additione — 210. ad 332. producitur † 122. Item ex additione — 210. ad 192. producitur — 18. Sic — 210. † 000. ad 332 — 00. sunt 122 † 0. Item — 210 — 000. ad 192 † 00. sunt — 18 — 0.

6. *Duorum logarithmorum, hic illius defectiuus, ille autem huius abundans propriè dicitur: cum & numerum, & cyphras communes seu eosdem: signa verò omnia † & — penitus contraria habeant.*

Vt abundantis 56312. defectiuus est — 56312. Item abundantis 56312 — 00. defectiuus est — 56312 † 00. Sic abundantis 56312 † 00. defectiuus est — 56312 — 00.

7. *Abundantem substrahere, est eius defectiuum addere.*

Vt substrahere abundantem 56312. ex — 73495. idem erit, quod addere illius defectiuum, qui (per 6.) est — 56312.

56312. ad eundem — 73495. fientque (per 4. præmissam) ——129807. Sic substrahere 56312 † 00. ex — 73495 ——000. est idem quod addere — 56312 † 00. ad — 73495 — 000. fiuntque (per 4. & 5. præcedentes) —— 129807 — 00000.

8. *Defectiuum substrahere est eius abundantem addere.*

Vt substrahere defectiuum — 4216. ex † 5392. est idem quod addere 4216. ad 5392. & (per 4.) producere 9608. Sic idem est substrahere — 4216 † 00. ex 5392 † 0. quod addere 4216 — ad 5392 † 0. & producere 9608 — 0.

9. *Logarithmum numero-tenus augere vel minuere saluo valore pristino, est ad illum addere, aut ab eo substrahere quemuis ex logarithmis sequentibus, scilicet* 23025842 † 0. *vel* 46051684 † 00. *vel* 69077527 † 000. *vel* 92103369 † 0000. *vel* 115129211 † 00000. *nihil prorsus significantibus.*

Vt sit logarithmus 39156 — 0. cui si addideris illorum quemuis, vt exempli gratia, 23025842 † 0. fiet inde 23064998. maior numero, valore autem prorsus idem qui 39156 — 0. Namque huius 39156 — 0. logarithmi, quantitas seu valor numeralis (per 12. & 13. sect. seq. huius) est 9960920. à quibus deme vnicam figuram vltimam prout — 0. notat, & fiet 996092. Illius autem logarithmi 23064998. valor numeralis (per seq. sect. 12. & 13. huius) est etiam 996092. idem, qui prius.

Exemplum minutionis.

SIt Logarithmus 25451769. minuendus, à quo si subduxeris 23025842 † 0. relinquitur 2425927 — 0. eiusdem valoris, cuius prior hic 25451769. Nam simplicis & puri logarithmi 2425927. valor est decuplus valoris vtriusuis eorum. Sunt ergo eorum valores inuicem æquales. Nihil enim aliud significat additio logarithmi 23025842 † 0. quam quod valor numeri cui additur, sit decupartiendus, & huic decimæ parti cyphra vnica sit adjicienda: substractio verò eiusdem significat valorem logarithmi à quo substrahitur decuplari, & ab hoc decuplo

cyphram vnicam abiici: remanet itaque in vtrâque pristinus valor. Sic 46051684 † 00. additus significat ad centesimam partem valoris duas cyphras adiici: & substractus, quod à centuplo duæ cyphræ reiiciantur: & sic de reliquis suprà expressis.

10. *Si itaque ad logarithmum minutum aliquod cyphris addideris, aut à logarithmo aucto cyphris substraxeris aliquem ex logarithmis suprascriptis totidem cyphrarum, producetur ex impuro logarithmus purus eiusdem valoris.*

Vt in superiore primo exemplo sit logarithmus impurus 39156 — 0. purgandus à cyphra sua & — signo, adde ergo illi 23025842 † 0, fiet inde, vt supra 23064998. logarithmus purus pristini valoris. Sic à logarithmo 63584468 † 00. impuro si substraxeris 46051684 † 00. totidem scilicet cyphrarum, relinquetur logarithmus 17532784. purus, & eiusdem valoris, cuius prior ille impurus.

11. *Si ad logarithmum numero defectiuum addideris, aliquem ex supradictis logarithmis nonæ sectionis numero maiorem, proueniet logarithmus eiusdem valoris numero abundans.*

Vt ad logarithmum — 28595270 — 0000. adde quemuis ex numeris nonæ sectionis numero majorem. v. g. 46051684 † 00. & fiet inde 17456414 — 00. eiusdem valoris, & numero abundans.

12. *Logarithmorum in tabula nostra numero-tenus inuentorum sinus, tangentes, secantes seu numerales valores quoscunque exhibere poteris, per cap. 3. sect. 11. 14. 22. 25. 28. 30. siue sint puri, siue impuri.*

Vt logarithmo 36. graduum & 40. minutorum, qui est 5155724. in tertia columna, respondet suus sinus 5971586. in secunda: & eius defectiuo — 5155724. respondet in tabula secantium 16745970. secans 53. Gr. 20. m. Item logarithmo differentiali 2950794. in quarta columna, respondet tangens (in sua tabula) 7444724 & eius defectiuo 2950794. respondet tangens 13432331. graduum scilicet 53. & 20. minut. Sic logarithmi 2204930. in quinta columna numeralis valor est in sexta columna 8021232. sinus scilicet gr. 53. & 20. m. & eiusdem defectiui scilicet —

2204

2204930. numeralis valor est secans 12466913. conueniens gradibus 36. & 40. min.

Exemplum impurorum.

SIt logarithmi impuri 97796 — o. inquirendus valor. huic numero tenus respondet in tabula nostra sinus 9902681. à quo aufer dextimam figuram (provt — o. indicat) & fient 990268. valor logarithmi 97796 — o. quæsitus. Sic logarithmi 25451769 † oo. valor est 78459100. quia logarithmo 25451769. puro respondet in tabula nostra sinus 784591. Item logarithmi — 349136 — oo. in quarta columna, apud gradum 46. reperti, valor erit 103553. quia tangens 46. graduum est 10355302. Sic logarithmi — 6350305 — oo. in tertia columna apud gradum 32. reperti, valor est 188708, quia secans complementi 32. graduum, scilicet 58. graduum, est 188708oo. cuius duæ vltimæ & dextimæ figuræ oo. delendæ sunt propter — oo. annexa logarithmo.

13. *Logarithmorum datorum, in tabula nostra non repertorum numerales valores æstimare.*

Ad vulgares Geodesias sufficit plerumque, logarithmi tabulati propinquioris dato, numeralem valorem pro dati accipere: verùm si propius ad metam accedere desideras, logarithmum datum per nonam huius numero-tenus auge, vel minue saluo valore pristino, donec aut in tabula reperiatur, aut alicui tabulato satis similis deuenerit, & huius logarithmi valor per præmissam inuentus, est quem quæris, vt exempli gratia, quæratur valor huius logarithmi 23149721 † o. cui in tabula non reperitur similis vel satis propinquus. verùm si ab illo subduxeris 23025842 † o. relinquetur 123879. cui sub 81. gradu reperietur satis propinquus & similis 123881. cuius sinus 9876883. per præmissam inuentus, est valor oblati logarithmi 23149721 † o. quæsitus.

ADMO

ADMONITIO.

PRo hac ſectione, & ſecunda huius monitum volumus, numerorum datorum logarithmos, & contra logarithmorum datorum numerales valores (vbi non reperiuntur in tabula) omnium accuratiſſimè exhiberi per modum ipſum quo creantur, aut reſoluuntur logarithmi, qui eſt, vt à ſinu dato per media Geometricè proportionalia deſcendas, donec in proximè minorem ſinum tabulatum perueneris: ſimiliter ab huius logarithmo tabulato deſcendas etiam per totidem media Arithmetica congrua & horum vltimus erit illorum primi logarithmus: & contra per reſolutionem, vt à logarithmo dato per media Arithmetica in logarithmum tabulatum proximè minorem deſcendas, & ab huius valore tabulato ſimiliter etiam deſcendas per totidem media Geometrica & congrua: & horum vltimus erit numeralis valor illorum logarithmorum primi. Verùm quæ æqui-differentia Arithmetica cuique continuatæ proportioni Geometricæ conueniat & ſit congrua, exquirere non eſt mediocris ingenij. Quare de his (Deo aſpirante) vbi de logarithmis condendis & creandis agetur, amplius aliquando differemus.

DE AMPLISSIMO LOGARITHMOrum vſu, & expedita per eos praxi.

CAP. V.

Problema I.

EX trium proportionalium Logarithmis, dato logarithmo medio & altero extremo, reliquum extremum, eiuſve proportionalem, vel arcum, per vnicam duplationem & ſubſtractionem dare.

Quum

Quum per secundam prop.cap.2.duplum medii (scilicet logarithmi) minutum altero extremorũ æquetur reliquo, ideo à duplo medii logarithmi dati aufer logarithmum extremi datum, & relinquetur logarithmus extremi quæsiti: cui in tertia, quarta, aut quinta columna tabulæ inuentæ respondet arcus in prima & septima; sinus autem in secunda, aut sexta: & sui secantes aut tangentes in tabulis suis per cap.3.sect. 1.2.6.8.11.14.22.25.28.30. pro extremo quæsito habentur.

Exemplum.

DEntur 10000000. primũ proportionale, & 7071068. secundum, quæratur tertium. Id vulgò exquiritur medium in se quadratè multiplicando, & hoc quadratum per primum diuidendo. Sed nos facilius medii logarithmum 3465735. duplando, & ab hoc duplo, quod est 6931470. logarithmum primi (qui est 0) auferendo: & ita restat 6931470. logarithmus quæsitus: cuius arcum 30. graduum, & sinum 5000000. (scilicet proportionale quæsitum) iuxta eum inuenies. Sunt ergo 10000000. 7071068. 5000000. tria proportionalia, quorum vltimum sola duplatione, & substractione acquisiuimus, quod polliciti sumus. Item duo proportionalia 10562556. primum, & 7660445. secundum, aut saltem eorum logarithmi —— 547302. & 2665149. dentur. Tertium sic habebis. Ab huius duplo 5330298. aufer —— 547302. & (per 8. sect. cap. 4.) producitur logarithmus 5877600. 33. grad. & 45. min. cuius sinus 5555702. est tertiũ proportionale quæsitũ.

Problema 2.

Ex trium proportionalium logarithmis, datis logarithmis extremis, medium, eiusque proportionale, & arcum per vnicam additionem & bipartitionem dare.

Quum per sect. 3. cap. 2. duplum logarithmi medij æquetur aggregato extremorum, ideo extremorum logarithmos adde: productum bipartire, & emerget logarithmus medij: atque inde medium & medij arcus innotescit in columnis, & per sectiones, vt supra.

Exempli gratia.

Dentur extrema 10000000.& 5000000 quæratur medium. Id vulgò acquiritur multiplicando data illa inuicem,& producti radicem quadratam extrahendo. Verùm nos ſic facilius.Datos extremorum logarithmos,0.primi, & 6931470. vltimi addimus, & aggregatum 6931470. bipartimur,fietque 3465735. optatus medij logarithmus. Vnde ipſum medium 7071068,& eius arcus 45. Gr.ratione ſupradicta habentur. Item ſint extrema data 10562556. & 5555702. eorum logarithmi —— 547302. & 5877600. Horum additorum ſumma eſt 5330298.per ſect. 5. cap. 4. quam bipartimur,& fit 2665149.logarithmus, & eius arcus 50. graduum: Et ſinus, ſeu medium proportionale quæſitum eſt 7660445. ſola additione, & bipartitione inuentum.

Problema 3.

Ex quatuor proportionalium logarithmis,datis tribus, eorumve arcubus,inuenire quartum logarithmum, eiuſque ſinum, & arcum per vnicam additionem, & ſubſtractionem.

In hoc problemate quæſitum ſemper pro quarto ſtatuimus, ita vt datorum primum ſe habeat ad ſecundum, vt tertium ad quæſitum.Quumque ita conſtitutorum aggregatum ex logarithmis ſecundi & tertij minutum logorithmo primi æquetur quarti logarithmo per 4. ſect. cap. 2. Ideo logarithmos ſecundi & tertij adde, & hinc aufer logarithmum primi,&prouenict logarithmus quarti quæſiti:& inde ipſum quartum,& eius arcus.

Exempli gratia.

Sit vt 7660445. ad 9848078. ita 5000000.ad quartum. quod quærimus.Hoc vulgus acquirit ducendo ſecundum in tertium, & diuidendo per primum. Tu autem ſic facilius logarithmos ſecundi 153088.& tertij 6931469.addes, fiet 7084557. à quo auferes logarithmum primi, qui eſt 2665149,& relinquetur 4419408.logarithmus quarti:cuius ſinus 6427876.eſt ipſum quartum deſideratum, & eius arcus eſt 40. graduum. Idem proueniret ſi (ſpretis ſinibus

bus) ſolum darentur tres ſui arcus 50. Gra. 80. Gr. & 30. Gr. Namque ex logarithmis arcuum 80. Gr. & 30. Gr. ablato logarithmo 50. Gr. remanebit logarithmus 40. Gr. Et ita ipſe arcus 40. Gr. innoteſcet abſque ſinibus, eorumve multiplicatione aut diuiſione, prout initio polliciti ſumus.

Aliud exemplum.

SIt vt tangens ſeu fœcundus numerus 45. Gr. ad ſinum 57. Gr. ita fœcundus ſeu tangens 35. Gr. ad ſinum quartum tacitum, cuius arcum neglectis & ſpretis tam ſinibus quàm tangentibus, ſic inueniemus. Logarithmum differentialem 35. Gr. ſcilicet 3563784. in media columna inuentum ad logarithmum 57. Gr. videlicet 1759372. in quinta columna locatum addimus: à producto videlicet 5323156. differentialem 45. Gr. qui eſt 698698. ſubducimus, & relinquitur 4624458. Logarithmus quarti (ſinus ſcilicet,) quo in tertia columna per *11.* ſect. cap. 3. reperto, reperies juxta eum in prima colũna 39. Grad. 2. minut. ferè qui eſt arcus quæſitꝰ quarti proportionalis ſeu ſinus ſpreti.

Hac ratione proportionalium arcus, abſque eorum ſinibus, tangentibus, ſecantibus, aut proportionalibus quibuſcunque acquiruntur.

Quod certè compendium ad triangulorum planorum angulos dimetiendos, & ad vniuerſam ſphæricorum Trigonometriam conducit plurimum: vt ſuo loco patebit.

Problema 4.

Quatuor continuè proportionalium datis extremis eorumve arcubus, mediorum quodvis, eorumve arcuum quemuis inuenire, inducta ſimplici tripartione pro ardua cubicæ radicis extractione.

Quum in horum Logarithmis, triplum cuiuſque medij æquetur aggregato extremi remoti & dupli vicini, per prop. 6. cap. 2. Ideo duplum logarithmi extremi alterutrius ad logarithmum extremi reliqui adde, & productum tripartire, & proueniet logarithmus medij priori extremo proximi, & eodem modo alterum medium. Vt exempli gratia: Sint extrema, primum 4029246. vltimum verò

10562556. Quæruntur media, quæ absque extractione radicis cubicæ sic inuenies. Datorum logarithmi sunt 9090051. & —— 547302. ad illius duplum 18180102. adde hunc, & fiet 17632800. qui tripartitus producit 5877600. Logarithmum, cuius sinus 5555702, est prius mediū quæsitum. Item simili modo ad huius —— 547302. duplum, quod est —— 1094604. adde illum 9090051, & producetur 7995447. qui tripartitus producit 2665149. Logarithmum, cuius sinus 7560445. est posterius medium etiam quæsitum. Quatuor itaque proportionalia continua sunt 4029246. 5555702. 7660445. & 10562556.

Aliud exemplum.

SInt extrema data 14142135. & 5000000. illius in tabula secantium inuenti logarithmus in tabula nostra est —— 3465735. huius verò 5000000. logarithmus est 6931470. cuius duplo 13862940. adde —— 3465735. fiet 10397205. quem tripartire, & fit † 3465735. logarithmus medij proportionalis minori extremo 5000000. proximi, quod est 7071068. Sic duplo —— 3465735. quod est —— 6931470. adde † 6931470. & fiet inde 0. seu nihil, quod tripartitum etiam reddit 0. cuius sinus & valor est 10000000. pro reliquo & maiore medio. Quatuor itaque hæc continuè proportionalia sunt 12142135. 10000000. 7071068. 5000000.

CONCLVSIO.

EX his prælibatis iudicent eruditi quantum emolumenti adferent illis logarithmi: quandoquidem per eorum additionem multiplicatio, per substractionem diuisio, per bipartionem extractio quadrata, per tripartitionem cubica, & per alias faciles prosthaphæreses omnia grauiora calculi opera euitantur; cuius rei specimen generale hoc priore libro exhibuimus. Sequente autem de eorundem proprio & particulari vsu in nobili illa Geometriæ specie, quæ Trigonometria dicitur, tractaturi sumus.

FINIS PRIORIS LIBRI.

LIBER SECVNDVS

DE CANONIS MIRIFICI LOGARITHMORVM PRÆCLARO VSV IN Trigonometria.

CAP. I.

QVVM Geometria ſit ars benè metiendi, Dimenſio ſit magnitudinum propoſitarum, magnitudines figuram (potentia ſaltem) conſtituant, figura ſit triangulum, aut triangulatum: Triangulatum verò compoſitum ſit ex triangulis, quibus ſuiſque, partibus menſuratis, menſurabitur & illud, illiuſque partes omnes. Certum igitur eſt ex triangulorum doctrinâ omnis Geometricæ quæſtionis Solutionem Logiſticam pendere.

Triangulum aut rectilineum eſt, aut Sphericum.

De Rectilineis, prop. I.

R*Ectilinei tres anguli æquantur duobus rectis.*

Vnde duobus datis, aufer eorum aggregatum ex 180 gradibus, & proueniet tertius. Item vnico ex 180. gradibus ablato, reſtat reliquorum duorum aggregatum.

Rectilineum aut rectangulum eſt, obliquangulum.

In rectangulis crura vocamus, quæ rectum angulum ambiunt:hypotenusam,quæ subtendit.

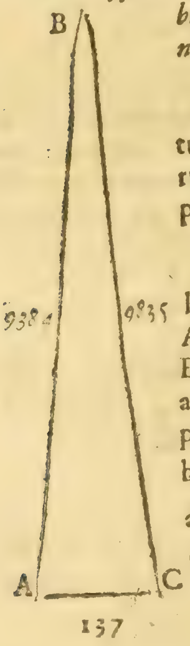
Propositio 2.

In rectangulo Logarithmus cruris æquatur aggregato ex Logarithmo anguli ei oppositi,& Logarithmo hypotenusæ.

Quum ex Trigonometriæ principiis pateat, alterutrum-uis crus se habere ad sinum anguli ei oppositi, vt hypotenusa ad sinum totum:& (per prop.5.cap. 2. lib. 1.) horum quatuor proportionalium logarithmi secundi & tertij, æquentur logarithmis primi & quarti : quarti autem logarithmus sit o, seu nihil (per collarium 6. def. cap. 1. lib. 1.) Ideo (vt supra) logarithmus cruris æquatur aggregato ex logarithmo anguli quem subtendit, & logarithmo hypotenusæ.

Corollarium.

Vnde hypotenusæ,cruris,& anguli quem subtendit,duobus quibuscunque datis,tertium,atque inde in reliquæ omnes rectanguli partes innotescent.



Quia enim hæc tria cum sinu toto constituunt quatuor proportionalia, certum est eorum quodvis quarto loco posse constitui, & per 3. probl. cap. 5. lib. 1. acquiri.

Vt trianguli oblati A. B. C. in A rectanguli, detur hypotenusa B. C. 9385, cum crure A B 9384. Quæruntur anguli obliqui C.& B. Ex logarithmo igitur A.B. 635870——000. Suaufer logarithmum B C. 634799 —— 000. Supersunt 1071 logarithmus anguli C, cui in tabula respondent 89 g 9' $\frac{3}{4}$ pro angulo C. & ex aduerso 0 g 50' $\frac{1}{4}$ pro eius complemento, angulo scilicet B.

Vice

Vice versa si detur angulus C, cum crure recti anguli A.B. & quæratur hypotenusa B.C.

Ex Logarithmo A. B. 635870 — 000 aufer Logarithmum anguli C. 1071, & prouenient 634799 — 000 Logarithmus B.C. 9385 hypotenusæ quæsitæ.

Tertio si datis B.C, & angulo C. quæratur A B: adde Logarithmum B.C. 634799 — 000, ad 1071 Logarithmum anguli C., & producentur 635870 — 000 Logarithmus numeri 9384 cruri A. B. quæsito respondentis. Nec secus ipsum crus reliquum A. C. ex angulo B. (qui est complementum anguli C.) jam cognito habetur. Atque ita omnes huius rectanguli partes innotescunt.

Propositio 3.

In rectangulo logarithmus cuiusvis cruris, est æqualis aggregato ex differentiali oppositi anguli, & logarithmo reliqui cruris.

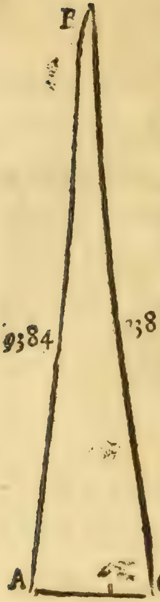
Quum ex vulgari doctrina triangulorum constet, quod alterutrum crus se habeat ad tangentem sibi oppositi anguli, vt reliquum crus ad sinum totum: & quum (per prop. 5. cap. 2. lib. 1.) ex his quatuor proportionalibus logarithmi mediorum (id est, differentialis anguli, & logarithmus cruris eum ambientis) æquentur logarithmis cruris eundem subtendentis, & sinus totius (qui est nihil, seu 0.) ideo logarithmus cruris est æqualis aggregato, &c. vt supra.

Corollarium.

Vnde ex cruribus recti, & angulo alteri eorum opposito, duobus quibuscunque datis, tertium (per hanc,) atque proinde cætera omnes rectanguli partes (per præced.) innotescent.

Quandoquidem hæc tria cum sinu toto constituant quatuor proportionalia, certum est eorum quodvis quarto loco posse collocari, & per 3. probl. cap. 5. lib. 1. acquiri.

Vt præcedentis trianguli A B C, in A rectanguli datis cruribus AB, 9384. & AC, 137. Quæratur angulus B. Ex Logarithmo A C,



A C,42924534—000. aufer 635870—000, Logarithmum A B. & prouenient 42288664, differentialis anguli B, o ḡ 56. íí, quæſiti. Verum ſi dentur crus A C,137:& angulus B. o ḡ 56.íí, habebitur crus A B auferendo 42288664.differentialem anguli B. à Logarithmo A C.qui eſt 42924534 —— 000. Inde enim proueniens 635870 — 000.eſt logarithmus numeri 9384. qui crus eſt A B. quæſitum. Tertiò datis crure A B,9384.& angulo B o ḡ, 56. íí : vt habeatur crus A C.adde 635870 — 000.Logarith.cruris A B.ad 42288664, differentialem anguli B. & prouenient 42924534 —000 , Logarithmus 137, cruris A C,quæſiti. Hypotenuſa autem B C per præced. prop. habetur. Angulus etiam C,patet,quum ſit complementum anguli B,jam cogniti.Et ita per hanc,& præmiſſam, ex latere quouis,& parte alia quauis rectanguli datis reliquæ omnes eius partes innoteſcent.

Completam ergo habes rectangulorum rectilineorum ſcientiam:ſequitur obliquangulorum.

DE TRIANGVLIS RECTILINEIS præſertim obliquangulis.

CAP. II.

Propoſitio 4.

IN omni triangulo,aggregatum ex Logarithmis anguli cuiuſvis, & lateris eum ambientis,æquatur aggregato ex logarithmis lateris,& anguli eis oppoſitorum.

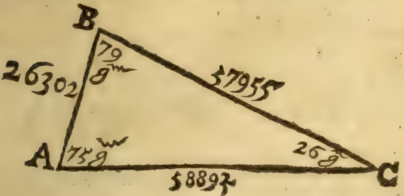
Quia omnium laterum ad oppoſitorum angulorum ſinus eadem eſt ratio:& ita factum ex anguli cuiuſvis ſinu recto,& latere quouis eum ambiente,æquatur facto ex latere ſubtendente priorem angulum,& ſinu anguli ſubtē-

ſi à priore latere. Ideo (per prop. 5. cap. 2. 1.) aggregatum ex Logarithmis &c. æquatur. vt ſupra.

Corollarium.

Vnde ex duobus angulis quibuſcunque datæ ſpeciei , & ſuis ſubtendentibus , ſi tria dantur , quartum quodcunque , atque inde cætera omnes trianguli partes innoteſcent.

Horum enim quatuor proportionaliũ quodvis quæſitũ poteſt quarto loco conſtitui,& per 3. probl.cap.5.lib.1.inueniri.



Vt obliquanguli A.B. C detur A B.26302,& B C.57955, & angulus C. 26 graduum:Quæraturque angulus A , qui ſic habetur. Adde 5454707 —oo Logarithmũ B C. ad 8246889 logarithmum ſcilicet C 26 graduum , & fient 13701596 — oo. Hinc aufer logarithmum A B , qui eſt 13354921 — oo , reſtant 346675 logarithmus 75 graduum, & paulò pluris , anguli ſcilicet , A quæſiti,ſi A prædicatur acutus:alioqui 105 g (per 1.& 2.ſect.cap.3.lib.1.) ſi pronuncietur obtuſus.

Vice verſa ſi detur angulus A jam 75 graduum , atque angulus C. & latus B C. vt ſupra : & quæratur A B- adde 5454707 — oo logarithmum B C. ad 8246889 logarithmum anguli C,fient,vt ſupra,13701596 — oo à quibus aufer 346675 logarithmum anguli A , prouenient 13354921 — oo logarithmus lateris A B , & numeri eius 26302 quæſiti. Habitis jam angulis A. 75 g & C. 26 g, erit angulus B. 79 gr. per 1. huius. Ex quo jam habito , non ſecus acquiritur latus ei oppoſitum A C. 58892 ,quàm nuperrimè ex angulo C. innotuit latus ei oppoſitum A B. Itaque jam patent omnes huius obliquanguli partes.

In obliquangulis crura vocamus , quæ angulum quemvis ambiunt: baſim quæ ſubtendit.

Propoſitio 5.

In obliquangulis , logarithmus aggregati crurum ſubductus à

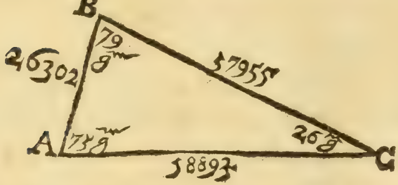
summa facta ex logarithmo differentiæ crurum, & differentiali semi-aggregati suorum oppositorum angulorum, relinquit differentialem semi-differentiæ eorundem.

Quia, vt aggregatum crurum ad differentiam crurum, ita tangens semi-aggregati suorum oppositorum angulorum, se habet ad tangentem semi-differentiæ eorundem. Vnde analoga sunt, & (per prop. 1. cap. 2. lib. 1.) eorundem differentiæ seu excessus sunt æquales. Necessariò igitur (per prop. 4. cap. 2. lib. 1.) concludimus vt supra.

Corollarium.

Vnde ex duobus cruribus, & angulo comprahenso, innotescunt (per hanc) anguli reliqui oppositi: atque inde (per præmissam) reliquum latus.

Nam subducto logarithmo aggregati crurum, à summa facta ex logarithmo differentiæ crurum, & differentiali semi-aggregati oppositorum angulorum additis, proueniet differentialis semi-differentiæ eorundem angulorum: quâ semi-differentia addita ad semi-aggregatum dictum, proueniet angulus maior, & substracta minor.



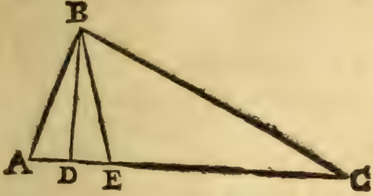
Vt repetiti superioris obliquanguli ABC dentur crura, A B. 26302, & B C. 57955, & angulus comprahensus B. 79 graduum. Quærantur autem reliqui anguli A. & C. Aggregatum crurum A B. & B C est 84257, eiusque logarithmus est 24738819 — o. differentia autem eorundem A B, & B C est 31653, eiusq; Logarithm. est 34529210 — o. Quumque B angulus detur 79 g erit (per 1. huius) aggregatum angulorum A & C, graduum 101, semi-aggragatum verò 50 g 30, cuius differentialis est —1931766, quo ad 34529210 — o addito, fient 32597444 — o. hinc ablatis 24738819 — prouenient † 7858625 differentialis graduum 24.30, qui sunt semi-differentia angulorum A & C quæsitorum. Hanc ergo semi-differentiam 24. 30 adde

ad se

ad semi-aggregatum 59.36, fient 75 gradus, pro angulo A quæsitorum maiore, & substrahe eosdem $24\frac{1}{2}$ gradus ab eisdem $50\frac{1}{2}$ gradibus, & relinquentur 26 gradus pro angulo B quæsitorum minore.

Definitio.

In obliquangulis vera basis semper est vel aggregatum casuum: & tunc differentia casuum basis alterna vocatur: vel vera basis est differentia casuum: & tum aggregatum casuum vocamus alternam.



Vt trianguli A B C. casus minor est A D: casus maior est D C. Casuum aggregatum A C est basis vera. Et in hoc triangulo aufer casum minorem A D, seu ei æqualem D E à casu majore D C, relinquetur differentia casuum E C, quam basim alternam vocamus. Contrà verò in triangulo E B C casus minor est D E (cui æquatur D A) Casus maior est D C, & casuum differentia E C est basis vera. Casuum autem aggregatum, scilicet A C, basim alternam vocamus.

Propositio 6.

In obliquangulis summa logarithmorū aggregati & differentiæ crurū, est æqualis summæ Logarithmorum basium, veræ, & alternæ,

Quia basis vera se habet ad aggregatum crurum, vt differentia crurum ad basim alternam: Ideo (per prop. 5. cap. 2. lib. 1.) necessariò concludimus, basium logarithmos æquari logarithmis aggregati & differentiæ crurum, vt supra.

Corollarium.

Vnde ex obliquangulo datorum laterum, fiunt duo rectangula notarum hypotenusarum cum altero cuiusque crure, quæ (per 2. huius) reliquas etiam omnes obliquanguli partes notas reddunt.

Nam addito logarithmo aggregati crurum ad logarithmum differentiæ crurum, & hinc ablato logarithmo basis veræ, proueniet logarithmus basis alternæ, per prop. 4. cap. 2. & probl. 3. cap. 5. lib. 1. Harum itaque basium semi-ag-

gregatum est casus maior: semi-differentia verò casus minor. Vt superioris trianguli A B C dentur latera, videlicet crus A B 26302, & crus B C 57955, & basis A C 58892, & quærantur cætera. Aggregatum crurum est 84257, eiusque logarithmus est 24738819—0. Differentia crurum est 31653, eiusque logarithmus est 34529210—0. Hos logarithmos adde, fient inde 59268029—00, à quibus aufer 5293461—00 logarithmum basis A C, restant 53974568 logarithmus numeri 45286 basis alternæ: quam ad veram adde, fient inde 104178, quorum dimidium est 52089, D C. casus maior. Eandem ab eadem aufer, fient inde 13606, quorum dimidium est 6803, A D casus minor.

Rectanguli itaque A D B. habitis jam, hypotenusa A B, & crure altero A D. atque rectanguli B D C habitis, hypotenusa B C, & crure D C, innotescunt (per 2. huius) anguli rectangulorum apud A & B & C, & per consequens omnes etiam obliquanguli oblati partes ex præmissis propalantur.

Nec secus agendum foret si darentur latera trianguli E B C, & cæteræ partes quærantur. Ex cruribus enim & basi vera E C, innotescit basis alterna A C. atque ex his vterque casus, & cætera, vt supra.

CONCLVSIO.

PErfectam igitur & completam iam habes omnium triangulorum rectilineorum doctrinam, quæ si aliquantulum operosa in Logarithmis rectarum variabilium inueniendis videatur: In motibus tamen planetarum computandis (in quibus scilicet eccentricitates orbium, elongationes Augium & apogæorum, epicyclorum diametri, & aliæ rectæ, eadem & inuariabiles permanent) eorum logarithmi exactè semel notati, semper in posterum, sine vlla mutatione subseruient, miranda certè facilitate, & certitudine.

Sequuntur iam Sphærica triangula, omnium difficillima, vt vulgò ab aliis traduntur: per Logarithmos tamen nostros, omnium facillima.

DE TRIANGVLIS SPHÆRICIS.

CAP. III.

Sententia 1.

IN triangulis Sphæricis angulus omnium quadranti quantitate proximus, & latus eum subtendens dubia sunt, An eiusdem, an diuersa sint speciei, nisi id aut computus, aut hypothesis prodat.

2. *Duorum vero obliquiorum angulorum quilibet est eiusdem speciei, cuius est latus eũ subtendẽs. Vnde alterius data, reliqui patet species.*

3. *Si trianguli angulus aliquis propinquior sit quadranti, quàm latus eum subtendens, erunt duo eius latera eiusdem speciei, & tertium quadrante minus.*

4. *Si verò trianguli latus aliquod propinquius sit quadranti, quàm eo subtensus angulus: erunt duo eius anguli eiusdem speciei, & tertius quadrante maior.*

5. *Triangulum Sphæricum aut est quadrantale, aut non.*

6. *Quadrantale est cuius aut latus, aut angulus æquatur quadranti.*
Vnde non rectanguli quadrantalis scientiam æquè facilè, ac rectanguli comparari posse, docemus.

7. *Quadrantale triangulum aut est multiplex, aut simplex.*

8. *Multiplex quadrantale aut est trirectangulum, aut birectangulum.*

9. *Trirectangulum est cuius singulæ partes quadranti æquantur.*

10. *Vnde omne triangulum, cuius trium partium non oppositarum singulæ quadranti æquantur, Trirectangulum est.*

11. *Birectangulum est, cuius duo tantum anguli, & sua subtendentia latera sigillatim quadranti æquantur.*

12. *In omni birectangulo angulus obliquus æquator suo subtendenti lateri.*

13. *Omne Triangulum cuius pars aliqua æquatur quadranti, & angulus aliquis obliquus æquatur suo subtendenti, Birectangulum est.*

14. *Omne Triangulum habens duas quascunque partes sigillatim quadranti æquales, & tertiam inæqualem, Birectangulum est.*

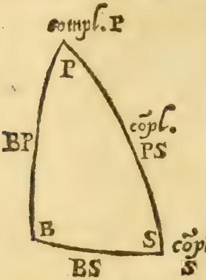
15. *Cætera quadrantalia simplicia dicuntur.*

DE SIMPLICIBVS QVADRANTALIBVS.

CAP. IV.

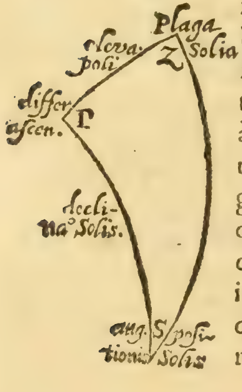
1. *Quadrantale simplex est, cuius vnica tantùm pars quadranti æquatur, cæteræ autem quinque partes sunt non quadrantes.*

2. *Harum quinque partium non quadrantium, Tres quæ à recto angulo, seu quadrante latere, situ remotiores sunt, in sua complementa conuertimus, & retento pristino ordine omnes quinque in circularem, seu pentagonalem situm statuimus, & circulares vocamus.*

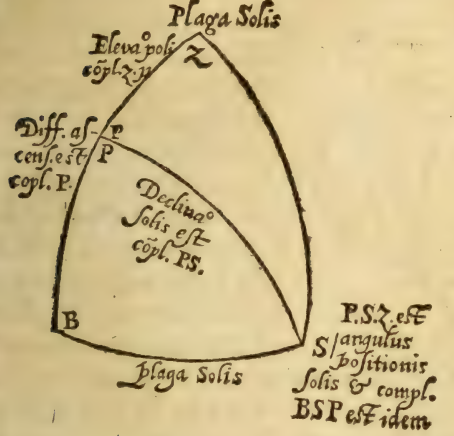


Sit primo triangulum B P S in B rectãgulum. Eius quinque partes obliquæ, seu non quadrantes, sunt hæ. B P latus ambiens rectum. P angulus obliquus alter. P S latus subtendens rectum. S angulus reliquus obliquus. S B reliquum latus ambiens rectum. Pro quibus nos facilioris calculi gratiâ assumimus latus, B P ipsum: complementum anguli P. Complementum lateris P S, complementum anguli S, atque ipsum latus SB, & seruato naturali situ has quinq; partes ordine statuimus, vt à margine, & circulares vocamus.

Similiter sit secundò triangulum quadrantale simplex, non rectangulum (ex centris solis orientis, poli, & zenith factum) S P Z, in latere Z S quadrantale. Eius quinque partes non quadrantes pristinæ sunt. Z angulus alter ambitus à latere quadrante. Latus P Z distantia poli à zenith P angulus subtensus à quadrante. Latus P S distantia poli à Sole, & angulus denique S alter angulorum quos quadrans ambit. Pro quibus nos ad faciliorem computum nostrũ assumimus, ipsum angulum Z, seu P Z S, qui est arcus plagæ Solis à septentrione. Complementum P Z, quod est ipsa eleuatio poli: Comple



Complementum anguli P, ſeu angeli Z P S, quod eſt differentia aſcenſionis, id eſt, differentia temporis ortus vel occaſus Solis ab hora ſexta. Complementum lateris P S quod eſt Solis declinatio: & angulum ipſum S ſeu P S Z, quem angulum poſitionis Solis, reſpectu ſcilicet poli & zenith, vocamus. Has quinque partes etiam circulari vel pentagono ſitu ſtatuimus, vt à margine, & circulares vocamus. Nec



aliæ fient circulares partes ſuperioris trianguli rectanguli B P S, ſi P polum, S ſolem, & B cardinalem borealem ſeu ſeptentrionalẽ poſuerit. Fient enim latus B P eleuatio poli, complementũ P differentia aſcenſionalis, Complementum P S declinatio ſolis, complementum S angulus poſitionis ſolis: ac denique B S plaga ſolis. Quæ ſunt eædem prorſus circulares partes, quæ ſuprà, & eodem ſitu leuorſum quo ille dextrorſum diſpoſitæ. Et ita in omnibus quadrantalibus tam rectangulis, quàm non rectangulis.

Corollarium.

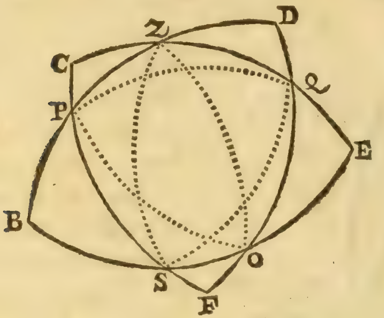
3. *Hinc fit quod plurima ſint triangula in partibus ſuis naturalibus haud conformia, quæ in partibus his circularibus prorſus conueniunt, & hac noſtra circularium methodo reſoluuntur.*

Vt ſatis lucidè apparet in duobus ſuperioribus triangulis B P S, & P Z S coniunctis. In quibus omnes naturales partes (præter P S & B S huius, & P S & P Z S illius) prorſus differunt: circulares verò partes omnes (vt ſuprà dictum eſt) conueniunt.

4. *Hæc circularium partium vniformitas manifeſtiſſimè patet in rectan*

rectangulis factis in superficie globi ex quinque circulis magnis, quorum primus secet secundum, secundus tertium, tertius quartum, quartus quintum, quintus denique primum ad rectos angulos: reliquæ verò sectiones omnes ad angulos obliquos fient.

Exempli gratia: Meridianus regionis D B, secat horizontem B E in puncto B. Horizon B E secat circulum E C, qui solem ambit (id est, qui circa solem tanquam polum ducitur) in puncto E. Circulus E C, qui solem ambit, secat meridianũ solis C F in puncto C. Meridianus solis C F æquatorem F D in puncto F: & tandem æquator F D secat meridianum regionis D B in puncto D. Et omnes hæ quinq; sectiones in punctis. B. E. C. F. D orthogonaliter & ad rectos angulos fiũt: factis cæteris sectionib⁹ in punctis Z.P.S.O.Q., ad angulos obliquos. Fientque ex his sectionibus rectangula quinque P B S, S F O, O E Q, Q D Z, & Z C P, quorum quamuis partes naturales differant, & in singulis triangulis varientur, circulares tamen quinque partes eædem sunt, quæ supra, absque vllo discrimine.



5, *Eadem circularium partium vniformitas, patet etiam in quadrãtalibus non rectangulis factis in superficie globi ex quinque punctis, quorum primus distet à secundo, secundus à tertio, tertius à quarto, quartus à quinto, & quintus à primo distantiis & arcubus æqualibus quadranti, aliæ verò punctorũ distantiæ inæquales sint quadrãti.*

Vt in eodem præcedente schemate puncta, P à Q, Q ab S, S ab Z, Z ab O, atque O à P, distant spatiis quadranti æqualibus: at verò P ab Z, Z à Q, Q ab O, O ab S, & S, à P, distant ab inuicem arcubus non quadrantibus. Et fient ex his distantiis quadrantalia non rectangula quinque, P Z Q, Z Q O, Q O S, O S P, & S P Z: quorum quamuis naturales partes differant: partes tamen circulares eædem & immutabiles hîc permanent, quæ supra. Scilicet, eleuatio poli, differentia ascensionalis,

lis, declinatio solis, angulus positionis solis, & plaga solis: quę omnibus superioribus triangulis ex æquo conueniunt, nec his duntaxat solis, verumetiam omnibus triangulis quæ oriuntur ex intersectionibus cæteris horum decem arcuū ad integros circulos productorum: quæ, quia plurima & cōfusa sunt, missa hic facimus. Hac epitome satis est monuisse omnem cōfusionem naturalium partium, & suarum regularum, his pauc circularibus partibus & sua regula vnica euitari, ac tolli.

6. *Quinque circularium partium, tres semper in quæstionem cadunt, quarum duæ dantur, tertia quæritur.*

7. *Atque harum trium vna est intermedia, & duæ sunt extremæ, quæ scilicet intermediæ aut circumponuntur, aut opponuntur.*

Verbi gratia, Sint partes tres in quæstione propositæ hæ, plaga solis, eleuatio poli, & differentia ascensionalis: quarum, eleuatio poli pars intermedia dicitur, & reliquæ duæ extremæ ei vicinæ, aut circumpositæ vocantur: verùm si tres partes in quæstionem cadentes forent, declinatio solis, eleuatio poli, & angulus positionis solis, vocabitur (vt prius) eleuatio poli intermedia: sed declinatio solis, & angulus positionis solis, extremæ à media remotæ, seu ei oppositæ dicentur: Par ratio est in reliquis quinque.

8. *Logarithmus intermediæ æquatur differentialibus circumpositarum extremarum, seu antilogarithmis oppositarum extremarum.*

Hoc theorema probatur inductione omnium trium partium seu triplicitatum, quæ ex quinque circularibus partibus quadrantalis prioris B P S rectanguli, constitui possunt, & in quæstionem cadere: posterioris autem non rectanguli P Z S triplicitates omittimus, quia eius omnes partes circulares (ex 18, & 19, & 20 præmissis) eædem prorsus sunt quantitate, quæ prioris. Quinque ergo partium circularium rectanguli B P S, (quæ sunt B S, seu plaga solis orientis: complementum B S P, seu angulus positionis solis: complementum S P, seu declinatio solis: complementum S P B, seu differentia ascensionalis: & P B, seu eleuatio poli) tres illæ quæ in quæstionem extremarum circumpositarum cadunt, sunt aut primò B S, complementum B S P, & complementum S P: aut secundò complementum B S P, complementum S P: & comple-

mentum S P B: aut tertiò complementum S P, complementum S P B, & P B:aut quartò complementum S P B, P B, & B S:aut quintò ſunt P B,B S,& complementum B S P.

Verum quia in omnibus his triplicitatibus, Tangens alterius extremæ eſt ad ſinum rectum intermediæ, vt ſinus totus ad tangentem reliquæ extremæ (pro vt ex vulgaribus demonſtrationibus Trigonometriæ patet.) Ideò (per noſtras demonſtrationes prop. 5. cap. 2. lib. 1.) Logarithmi mediarum (qui ſunt logarithmus ſolius inter mediæ per corollarium 6. def.cap.1.lib.1.)æquantur logarithmis tangentium vtriuſque extremæ. Sed Logarithmi tangentium harum extremarum ſunt differentiales earundem (ex ſect.22.& 25.cap. 3. lib. 1.) Logarithmus igitur ſolius intermediæ æquatur differentialibus circumpoſitarum extremarum, vt priore parte Theorematis aſſeruimus.Sequitur poſterioris partis confirmatio.

Earundem ergo quinque partium circularium,tres illæ quæ in quæſtionem extremarum intermediæ oppoſitarum cadunt, ſunt aut primò P B,complementum B S P,& complementum S P B:aut ſecundò B S,complementum S P, & P B: aut tertiò complementum B S P,complementum S P B,& B S:aut quartò complementum S P, P B, & complementum B S P: aut quintò denique complementum S P B, B S, & complementum S P.

Sed in omnibus his triplicitatibus ſeu quinque caſibus,ſinus rectus complementi alterius extremæ ſe habet ad ſinum rectum intermediæ,vt ſinus totus ad ſinum rectum complementi reliquæ extremæ (quod fuſiùs à Regiomontano, Copernico,Lansbergio,Pitiſco,& aliis demonſtratur, quàm vt breui hac epitome repetendum ſit) Ideò per noſtras demonſtrationes (prop.5.cap. 2. lib. 1.) Logarithmi complementorum harum extremarum æquantur logarithmis mediarum, id eſt, (vt dictum eſt) logarithmo ſolius intermediæ,At Logarithmi complementorum harum extremarum oppoſitarum ſunt earundem ipſarum partium antilogarithmi (ex def. ſect.13.& 16.cap.3.lib.1.) ſequitur ergo in his caſibus, quod logarithmus ſolius intermediæ æquetur antilogarithmis ſuarum extremarum oppoſitarum,vt aſſerit poſterior theorematis pars

tis pars. Totum itaque theorema conſtat. Præter hanc probationem per inductionem omnium caſuum, qui occurrere poſſunt, poteſt idem theorema lucidè perſpici ex 19ª & 20ª præcedentibus, in quorum ſchemate, homologa circularium partium conſtitutio earundem analogiæ ſimilitudinem arguit: ita vt quod de vna intermedia & ſuis extremis circumpoſitis, aut oppoſitis verè enuntiatur, de cæteris quatuor intermediis & ſuis extremis reſpectiuè circumpoſitis, aut oppoſitis negari non poſſit.

PORISMA GENERALE.

9. *Hinc ſequitur in quadrantalibus ſimplicibus, quod ex duabus partibus quibuſcunque datis tertia quævis innoteſcet. Semper enim aut intermedia quæritur, & eius logarithmus habetur addendo differentiales circumpoſitarum extremarum datarum: aut altera extremarum quæritur, & eius differentialis emergit ex ſubſtractione differentialis reliquæ extremæ datæ à* Logarithmo *intermediæ notæ: vt in quinque prioribus triplicitatibus rectanguli præcedentis theorematis, & totidem non rectanguli: aut intermedia quæritur, & eius logarithmus prouenit, addendo antilogarithmos oppoſitarum extremarum datarum: aut denique altera extremarum oppoſitarum quæritur: & eius antilogarithmus ex ſubductione antilogarithmi reliquæ extremæ oppoſitæ datæ ex logarithmo intermediæ notæ habetur. Vt in quinque poſterioribus caſibus rectanguli præcedentis theorematis, & totidem non rectanguli. Horum autem Logarithmorum, antilogarithmorum, & differentialium iam inuentorum cuilibet reſpondēt duo arcus diuerſarum ſpecierum. Ex ſpecie igitur quæſiti arcus per ſecundam, tertiam, quartam huius, aut per hypotheſim nota, ipſe arcus vere innoteſcet.*

Vt in priore exemplo ſeptimæ, Tres quæſtionis partes circulares ſunt, plaga ſolis, eleuatio poli, & differentia aſcenſionalis, id eſt, In rectangulo B P S partes B S, P B, & complemētum S P B: vel in non rectangulo quadrantali P Z S, partes P Z S, complementum P Z, & complementum S P Z: quarum trium dentur extremæ circumpoſitæ, ſcilicet plaga ſolis orientis B S, vel P Z S, 70 Gr. & differentia aſcenſionalis com-

plementum S P B, vel complementum S P Z, 16 Gr. 2′4, 2″7: & quæratur intermedia pars P.B, vel complementum P Z, quæ est eleuatio poli. Addatur ergo differentialis 70. Gr., viz. —— 10106827 ad differentialem 16 gr. 2′4. 2″7. videlicet ad 12226180. & prouenient 2119353. Logarithmus 54. graduum pro eleuatione poli quæsita.

ADMONITIO.

PRæter eleuationem poli hoc modo inuentam, habetur etiam secundò eâdem praxi plaga solis ex eleuatione poli, & angulo positionis solis. Item tertiò angulus positionis solis ex plaga solis, & eiusdem declinatione datis. Quartò declinatio solis ex angulo positionis solis, & differentia ascensionali. Quintò differentia ascensionalis ex declinatione solis, & eleuatione poli.

Secundum exemplum.

DEtur plaga solis orientis B S, seu P.Z. S, 70. graduum: & eleuatio poli 54 graduum, quæ est P.B, aut complementum P. Z. Quæratur autem differentia ascensionalis, scilicet complementum S.P.B, vel complementum S.P.Z. Et, quia hîc similiter extremæ partes circumponuntur intermediæ, ergo aufer differentialem plagæ solis seu 70. graduum, qui est —— 10106827. ex logarithmo eleuationis poli 54. graduum, scilicet ex 2119353: & prouenient inde 12226180. differentialis graduum 16. 2′4 2′7 ferè, arcus differentiæ ascensionalis quæsitæ.

ADMONITIO.

AD huius exempli imitationem habetur scundò declinatio solis ex differentia ascensionali, & eleuatione poli datis. Item tertiò angulus positionis solis ex declinatione solis, & differentia ascensionali, Quartò plaga solis ex angulo positionis solis, & declinatione eiusdem. Quintò eleuatio poli habetur ex plaga solis, & angulo positionis solis. Item contrà habetur. Sextò differentia ascensionalis ex declinatione solis,

ſolis,& angulo poſitionis ſolis datis. Septimò declinatio ſolis ex angulo poſitionis ſolis,& plaga eius. Octauò angulus poſitionis ſolis habetur ex plaga ſolis & eleuatione poli datis. Nonò plaga ſolis ex eleuatione poli, & differentia aſcenſionali. Decimò tandem eleuatio poli habetur ex differentia aſcenſionali,& declinatione ſolis datis.

Tertium exemplum.

IN poſteriore exemplo eiuſdem ſeptimæ tres quæſtionis partes circulares proponuntur hæ, declinatio ſolis, eleuatio poli,& angulus poſitionis ſolis. Eæ ſunt in rectangulo B. P. S. complementum P S. B P. & complementum B S P, & in non rectangulo quadrantali P.Z.S, eæ ſunt, complementum P. S. complementum Z.P.& Z.S. P. Quarum trium dentur extremæ oppoſitæ, ſcilicet declinatio ſolis, quæ eſt complementum P.S. 11. grad. 35. 51′, & angulus poſitionis ſolis, qui eſt complementum B.S.P, ſeu Z.S.P. 34 grad. 19 21′ ferè. Et quæratur intermedia pars B. P, ſeu complementum Z P, quæ eſt eleuatio poli. Addatur ergo antilogarithmus 11. grad. 35. 51′, qui eſt 206271 ad antilogarithmum 34. grad. 19. 21′, qui eſt 1913082 prouenient 2119353. Logarithmus 54. graduum pro eleuatione poli quæſita.

ADMONITIO.

PRæter eleuationem poli hoc jam modo inuentam, poteris ſecundò per eandem praxim habere plagam ſolis ex eiuſdem declinatione,& differentia aſcenſionali datis. Tertiò angulum poſitionis ſolis ex differentia aſcenſionali & eleuatione poli. Quarto declinationem ſolis ex eleuatione poli,& plaga ſolis. Et quintò inuenies differentiam aſcenſionalem ex plaga ſolis & angulo poſitionis ſolis datis.

Quartum exemplum.

DEtur declinatio ſolis complementum S.P. 11. graduum 35. 51′,& eleuatio poli B.P. ſeu complementum P.Z graduum 54. Quæratur autem angulus poſitionis ſolis complementum

mentum B.S.P, seu P, S, Z: &, quia hic similiter extremæ partes intermediæ opponuntur, igitur auferendus erit antilogarithmus 11. graduum 35.51″, qui est 206271. ex logarithmo 54. graduum, qui est 2119353. & supererunt 1913082. antilogarithmus 34. graduum 19.21′ ferè, qui sunt angulus positionis solis quæsitus.

ADMONITIO.

PRæter angulum positionis solis ac prima praxi acquisitum, habetur secundò eadem praxi declinatio solis ex datis differentia ascensionali & plaga solis. Tertiò habetur differentia ascensionalis ex datis eleuatione poli & angulo positionis solis. Quartò eleuatio poli inuenitur ex plaga solis & eiusdem declinatione datis. Quintò plaga solis acquiritur ex angulo positionis solis & differentia ascensionali. Sextò (contrario ordine) angulus positionis solis inuenitur ex plaga solis & differentia ascensionali datis. Septimò declinatio solis habetur ex angulo positionis solis, & eleuatione poli datis. Octauò differentia ascensionalis ex declinatione solis, & eiusdem plaga inuenitur. Nonò eleuatio poli habetur ex data differentia ascensionali, & angulo positionis solis. Decimò tandem acquiritur plaga solis, ex eleuatione poli, & declinatione solis datis.

Atque ita ad imitationem horum quatuor exemplorum, triginta variæ soluuntur quæstiones circularium partium, hoc est, triginta variæ quæstiones in quadrantali rectangulo, & totidem in non rectangulo soluuntur hoc porismate, beneficio vnius tantummodo additionis vel subtractionis. Cæterùm ad intelligentiam posterioris partis huius porismatis, de arcuum speciebus, vide exempla, (tertium, quartum, quintum, & sextum) sequentia.

DE

DE NON QVADRANTALIBVS mixtis.

CAP. V.

HActenus quadrantalium, sequitur triangulorum Sphericorum non quadrantalium doctrina.

1. *Non quadrantale est triangulum Sphæricum, cuius nec latus, nec angulus quadrans est.*
2. *Non quadrantale reducitur ad bina quadrantalia, Si à vertice ad eius basim (prout opus fuerit extensam) dimittatur perpendicularis, aut quadrans arcus.*
3. *Perpendicularis cadit intra triangulum, si anguli apud basim sint eiusdem speciei: extrà verò si diuersæ: & contrà.*
4. *Quadrans arcus cadit extra triangulum, si crura sint eiusdem speciei. Intrà verò si diuersæ & contrà.*
5. *Ex non quadrantalis sex partibus, tres datæ solùm sufficiunt ad reliquarum scientiam comparandam: nisi forsan trium datarum, quarum vna alteri opponatur, tertia sit propinquior quadranti, quam altera eiusdem generis data. In hoc enim casu requiritur etiam dari species partis quæ tertiæ opponitur, vt reliquæ sciantur.*

   Huius casus exempla sunt, quartum & sextum exemplum sequentium.
6. *Partes tres datæ aut miscellaneæ sunt, aut puræ.*
7. *Miscellaneæ sunt, quarum vna est diuersi generis à reliquis duabus.*

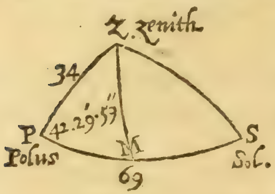
   Vt cùm dantur duo latera, & angulus aliquis: aut duo anguli cum latere aliquo.
8. *In partibus miscellaneis datis, si ab illo termino lateris dati in cuius reliquo termino sit angulus datus, cadat ad basim perpendicularis, aut quadrans datum illum angulum subtendens, reducetur non quadrantale ad bina quadrantalia (per nonam sect. cap. 4. huius) scibilia.*

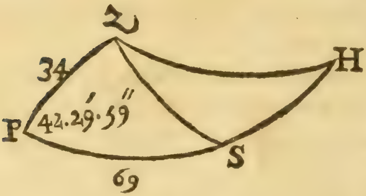
   Vnde & non quadrantalis partes (quia cum horum quadrantalium partibus, aut partium reliquis communes sunt) facilè innotescunt,

cunt, cognitis tamen prius per 2.3. & 4. sect. cap. 3. huius, aut ex hypothesi partium speciebus.

EXEMPLVM DVORVM LATERVM, & anguli interpositi datorum.

VT sit (vsus & exercitij gratia) triangulum Sphæricum non quadrantale in superficie primi mobilis descriptum P.Z.S. polum, Zenith, & solem referens: cuius sex partes sunt, latus P. Z. quod est interstitium poli & Zenith, seu complementum eleuationis poli. Latus Z. S, interstitium Zenith & solis, seu complementum altitudinis solis.





Latus P.S. interstitium poli & solis, seu complementum declinationis solis ab æquatore. Angulus Z. P. S. hora diei, seu tempora horaria æquatoris. Angulus P.Z.S, quæ plaga est, seu azimuth solis à septentrione. Angulus P.S. Z, qui angulus est situs & positionis solis ad polum & zenith. Harum sex partium dentur tres quæcunque mistellaneæ. Verbi gratia, angulus horarius Z.P.S. 42. 29'. 59". (qui horam secundam 49'. 59". 56"'. pomeridianam notat) & latus P.Z. 34. complementum eleuationis poli: atque latus. P S. 69. complementum declinationis solis. Ex quibus, vt acquirantur tres reliquæ partes, ab. Z. termino lateris. P Z. dati, dimittatur perpendicularis Z.M, aut, si mauis, quadrans Z, H. angulum datum Z.P.S. subtendens, reducensque non quadrantale oblatum P. Z. S. ad duo triangula in angulo M. quadrantalia, quæ sunt P. M. Z. & Z. M. S, vt in primo schemate: vel (si varietate delecteris) ad duo triangula in latere Z. H. quadrantalia, quæ sunt Z. H. P. & Z H. S. vt in secundo schemate: Quorum qua-

quadrantalium omnes partes per 9.sect.cap.4.huius acquires. Nam ex datis P Z 34.atque Z P M.seu Z P S, 42. 29'. 59''. inuenies perpendicularem Z M 22,11' 47'' & angulum P Z M. 52. 46'. 38''.& latus P M 26.26' 29'': quo ablato à P S 69. restat M S 42. 33'.31''. quo & perpendiculari Z M. jam cognitis, inuenies per 9.sect.cap. 4. huius angulum M S Z seu quæsitum P S Z, 31.6'5''.& latus quæsitū S Z 47. atque angulum M Z S 67. 38.11'. quo ad P Z M 52.46' 38''. addito, fit angulus reliquus quæsitus P Z S 120. 24'. 49''. Tres itaque habes partes quæsitas officio perpendicularis Z M, primi schematis. Easdem quoque officio quadrantis Z H secundi schematis venari poteris. Ex datis enim, vt suprà, P Z 34.& Z P S seu Z P H 42.29'. 59'', inuenies per eandem 9am. cap.4 huius, angulum Z H P.22.11'. 47'', & angulum P Z H 142.46',38'',& latus P H 116.26'. 29''. ex quo aufer P S 69.restat S H 47. 26'. 29''. quo & angulo apud H 22. 11'.47'' jam habitis, inuenies per 9 cap.4.huius, angulum H S Z 148 53'. 55''. eiusque ad semicirculum reliquum scilicet 31. 6'. 5''. angulum P S Z quæsitum: atque latus quæsitum S Z 47. Denique angulum H Z S 22.21'.49'' quo ex H Z P 142 46'.38''.ablato, restat angulus reliquus quæsitus P Z S 120. 24' 49''. prorsus vt suprà.

ADMONITIO.

HVius exempli imitatione nouem variæ soluuntur huius & cuiusque trianguli quæstiones. Ex datis enim eleuatione poli, hora diei, & declinatione solis illius diei, habetur (vt suprà) primò azimuth seu plaga solis, secundò altitudo solis, Tertiò angulus positionis solis. Item datis declinatione solis, angulo positionis solis, & altitudine solis, habetur quartò plaga solis, quintò eleuatio poli, sextò hora, seu arcus horarius. Item datis altitudine solis, plaga solis, & eleuatione poli, habetur septimò hora diei, octauò declinatio solis, nonò denique angulus positionis solis.

Secundum

Secundum exemplum duorum angulorum, & lateris interpositi, datorum.

PRæcedentium ſchematum datis angulis, horario ſcilicet Z.P.S.42.29'.59''.& plagæ ſolis P.Z.S.120,24',49''.cum complemento eleuationis poli,latere ſcilicet interpoſito P.Z.34. Tres cæteræ partes exquiruntur. Nam habitis primò (vt ſuprà) Z.M.22.11'.47'',& P.M.26.26'.29''.& angulo P.Z.M.52.46'.38''.quo ex P.Z.S.120.24'.49''.ablato relictoque angulo M.Z.S.67.38'.11''.ex hoc atque Z.M jam notis,inuenientur tandem latus quæſitum Z.S.47.& Z S.M.ſiue angulus quæſitus Z.S.P.31.6'.5''.atque M.S.42.33'.31''.quo ad P. M. addito, fit reliquum latus quæſitum P.S.69. Haſque beneficio perpendicularis primi ſchematis habes, nec ſecus eaſdem officio quadrantis ſecundi ſchematis acquirere poteris: acquiruntur enim (per nonam quarti huius) ex datis,anguli P.H.Z.& P.Z.H, & ex hoc ſubducto P.Z.S.dato,reſtat S.Z.H.quo,& angulo P.H.Z jam notis propalantur cæteræ omnes partes.

ADMONITIO.

HVius exempli imitatione nouem variæ ſoluuntur huius, & cuiuſque trianguli quæſtiones.Ex datis enim(vt ſuprà) hora diei, eleuatione poli, & plaga ſolis, habetur primò declinatio ſolis. Secundò angulus poſitionis ſolis, tertiò altitudo ſolis.Item datis hora diei,declinatione ſolis,& angulo poſitionis ſolis,habetur quartò altitudo ſolis, quintò plaga ſolis, ſextò eleuatio poli.Item datis angulo poſitionis ſolis, altitudine ſolis, & plaga ſolis acquiritur ſeptimò eleuatio poli octauo hora diei,nono declinatio ſolis.

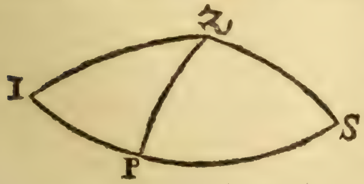
Tertium

Tertium exemplum duorum datorum laterum, quorum quadranti propinquius subtendit angulum datum.

PRæcedentium schematum dentur latera P. Z. 34. & eo quadranti propinquius Z.S.47.cum eo quem hoc subtendit angulo Z.P.S 42.2 6 59.acquirantur per 9 sect cap.4 huius Z.M.22.11.47.& P.Z M.52.46.38. & P. M. 26.26 29. & simili modo habebis Z.S.M.seu quæsitum angulum Z.S.P.certissimè enim scitur hic per 2.sent.cap.3. huius, minor quadrante, scilicet esse 31.6.5.& non esse 148.53 55. Habebis etiam angulum M.Z.S.67,38 11.quo ad P.Z.M.52.46. 38. addito, fit reliquus quæsitus angulus P.Z.S.120.24 49. Habebis denique & M.S,42.33.31.quo ad P.M 26.26.29 addito, fit quæsitum latus P,S,69.Nec secus eadem acquirere poteris (si libet) officio quadrantis Z.H.secundi schematis.

Quartum exemplum duorum datorum laterum, quorum quadranti minus propinquum subtendit angulum datum: magis autem propinquum subtendit angulum data tantùm speciei.

DEntur latera Z S,47,& eo quadranti minùs propinquum P Z 34. cum eo quem hoc subtendit angulo Z S P,31 65. deturque quod quem Z S subtendit (angulus scilicet S P Z) sit specie minor quadrante: Dimisso itaque ab Z. ad basim P. S. perpendiculari Z. M. (vt prius) aut quadrante Z I. vt hic) subtendente angulum datum Z. S.P.Acquirantur per 9.sect.



4.huius cæteræ partes, vt (exerciti & varietatis gratiâ) ex huius schematis quadrante Z.I.acquirens angulum Z I. S. 22. 11.47. & I.Z.S.157.36.11.Et S.I.132.33. 31 & simili modo habebis angulum I.P. ; & per consequens angulum quæsitum S.P.Z. 42.29.59.Quia ex hypothesi expressè quadrante minor

declaratur, alioquin nisi eius daretur species, foret (ex prima cap. 3. & quinta sect. huius cap.) incertus: potuit enim aliter fuisse 137. 30. 1″. Habebis etiam sic angulum I. Z. P. 37. 13′. 22″. quo ex I. Z. S. 157. 38. 11. ablato, relinquitur reliquus quæsitus angulus P. Z. S. 120. 24′. 49″. Habebis denique & I. P. 63. 33′. 31″. quo ex I S. 132. 33′. 31″. ablato, remanet quæsitum latus P. S. 69.

Easdem etiam metas attinges si beneficio perpendicularis Z. M. primi schematis partium logisticen quæsiueris.

ADMONITIO.

PRæcedentis tertij & huius quarti exemplorum imitatione, octodecim variæ soluuntur huius & cuiusque trianguli quæstiones. Ex datis enim (vt in tertio exemplo) eleuatione poli, altitudine solis, & hora diei, habetur primò plaga solis, secundò angulus positionis solis, tertiò declinatio solis. Item datis (vt in hoc quarto exemplo) eleuatione poli altitudine solis, & angulo positionis solis, habetur quartò plaga solis, quinto hora diei, sexto declinatio solis. Item datis altitudine solis, declinatione solis, & hora diei, habetur septimò angulus positionis solis, octauò plaga solis nonò eleuatio poli. Item datis altitudine solis, declinatione solis & plaga solis, habetur decimò angulus positionis solis, vndecimò hora diei, duodecimò eleuatio poli. Item datis declinatione solis, eleuatione poli, & angulo positionis solis, habetur decimotertiò plaga solis, decimoquartò altitudo solis, decimoquintò hora diei. Item datis declinatione solis, eleuatione poli, & plaga solis habetur decimosextò hora diei, decimoseptimò angulus positionis solis, & decimo-octauò altitudo solis.

Quintum exemplum duorum datorum angulorum, quorum quadranti propinquiorem latus datum subtendit.

TRianguli P. z. S. primi schematis, dentur anguli P. S. Z. 31. 6′. 5″. & eo quadranti propinquior S. P Z. 42. 29′. 59″. cum latere Z. S. 47 hunc subtendente. Ex quibus P. S. Z, & S. Z. habetur (per nonam quarti huius) perpendicularis Z. M. 22. 11′. 47″. &

4″7. & ceteræ partes quadrantalis S.Z.M. scilicet M. Z. S. 67. 38′. 11″ & M S 42. 33′ 31″. Sicut & ex perpendiculari hoc cum dato Z.P.S. seu Z.P.M. angulo, habentur partes omnes quadrantalis Z. M. P. Scilicet primò latus quæsitum P. Z. certissimè enim scitur hoc (per 2. sentent. cap. 3. huius) minus quadrante, videlicet esse 34. non autem esse 146. Deinde habetur P.Z. M. 52. 46′ 38″. quo ad S Z M 67. 38′ 11″. addito fit quæsitus angulus P. Z. S. 120. 24′ 49″. Vltimò habetur P.M. 26. 26′. 29″. quo ad M S. 42. 33′ 31″. addito, fit reliquum latus quæsitum P.S. 69. Has etiam ipsas partes aliter (si mauis) ex duobus proximè præcedentis Schematis quadrantalibus Z.I.S. & Z.I.P. acquirere poteris.

Sextum exemplum duorum datorum angulorum, quorum quadranti minus propinquum subtendit latus datum, magis autem propinquum subtendit latus data tantum speciei.

TRianguli P.Z.S. primi Schematis dentur anguli Z. P. S. 42. 29′ 59″. & eo quadranti minus propinquus Z.S.P. 31. 6′. 5″. cum eum subtendente latere P. Z. 34. Deturque quod angulum Z P.S. subtendens, (scilicet latus Z.S.) sit specie minus quadrante. Ex his datis quæratur perpendicularis Z M. 22. 11′. 47″. & cæteræ quadrantalis P. Z M. partes, scilicet P. Z. M. 52. 46′. 38″ & P.M. 26 26′ 29″ Sicut & ex perpendiculari hoc cum dato Z.S.M. seu. Z.S.P 31. 6′ 5″ quærantur partes omnes quadrantalis Z M.S. scilicet primò latus optatum Z.S. 47. quia ex hypothesi expressè quadrante minus declarantur, alioquin potuit fuisse 133. Nam (per 1. cap. 3. & quintam huius) incertum est nisi eius expressè detur species. Deinde angulus M. Z. S. 67. 38′. 11″. quo ad M.Z.P. 52 46′. 38″. addito fit optatus angulus P. z. S. 120. 24′. 49″. Denique habetur S. M. 42. 33′. 31″. Quo ad P.M. 26. 26′. 29″ addito, fit optata basis P. S. 69. Eandem etiam partes ex duobus quadrantalibus P.H.Z. & s.H.Z. secundi schematis, quàm facillimè acquirere poteris.

ADMONITIO.

PRæcedentis quinti & huius ſexti exemplorum imitatione, octodecim variæ ſoluuntur huius, & cuiuſque trianguli quæſtiones. Ex datis enim (vt in quinto exemplo) angulo poſitionis ſolis hora diei & altitudine ſolis, habetur primò eleuatio poli, ſecundò plaga ſolis, tertiò declinatio ſolis. Item datis (vt in hoc ſexto exemplo) hora diei, angulo poſitionis ſolis, & eleuatione poli, habetur quartò altitudo ſolis, quintò plaga ſolis, ſextò declinatio ſolis. Item datis hora diei, plaga ſolis, & altitudine ſolis, habetur ſeptimò declinatio ſolis, octauó angulus poſitionis ſolis, nonò eleuatio poli. Item datis hora diei, plaga ſolis, & declinatione ſolis, habetur decimò altitudo ſolis, vndecimò angulus poſitiônis ſolis, duodecimò eleuatio poli. Item datis plaga ſolis, angulo poſitionis ſolis, & declinatione ſolis, habetur decimotertiò eleuatio poli, decimoquartò hora diei, decimoquintò altitudo ſolis. Item datis plaga ſolis, angulo poſitionis ſolis, & eleuatione poli, habetur decimoſextò declinatio ſolis, decimoſeptimò hora diei, decimo-octauò altitudo ſolis. Atque ita huius ſolius canonis methodo, quinquaginta quatuor variæ ſoluuntur quæſtiones eiuſdem trianguli non quadrantalis. Cæteræ inferiùs ſoluentur.

9. *Ex his itaque patet quod duorum angulorum & ſuorũ ſubtendẽtium laterum tribus datis, quarti ſaltem* Logarithmus *innoteſcet, tacita etiam quadrantalium deſcriptione. Ab aggregato enim ex Logarithmis anguli & lateris ſibi adiacentis datorum, aufer* Logarithmum *tertij dati, & prouentet inde Logarithmus quarti quæſiti, ipſumque quartum, niſi ſit incertæ ſpeciei, innoteſcet.*

Vt ex ſuperioribus tertio, quarto, quinto, & ſexto exemplis percipi poteſt. Angulorum enim baſis Z.P.S. & Z.S.P. & ſuorum ſubtendentium crurum Z. S. & Z. P. dentur tria, quæ (verbi gratia) ſint crura Z. S. 47, eiuſque Logarithmus 3128580, & Z.P. 34. eiuſque logarithmus 5812606, cum huic adiacente angulo Z. P. S. 42. 29'. 59''. cuius Logarithmum 3921720 adde ad 5812606, fit 9734326 (Logarithmus ſcilicet taciti

taciti & suppressi perpendicularis Z.M.vel anguli Z.H.S. seu Z.I.P.) à quo aufer 3128580 remanet 6605746 Logarithmus quarti Z.S.P quæsiti.Ipsum itaque quartum Z.S.P. erit 31. 6'. 5''. Quoniam per 2.sect.cap.3 minus quadrante arguitur.Contrà autem datis Z.P.34. eiusque Logarithmo 5812606.& Z.S. 47.eiusque Logarithmo 3128580,cum huic adiacente angulo Z.S.P.31 6'.5''.ad cuius logarithmum 6605746, adde 3128580, fit aggregatum (vt supra) 9734326 à quo aufer 5812606.prouenient 3921720 Logarithmus quarti quæsiti,scilicet Z.P.S, cuius arcus per 1.sect. cap. 3. incertus est an sit 42. 29'. 59''. an 137.30'.1''.nisi declaret hypothesis maiórne, an minor sit quadrante.

DE NON QVADRANTALIBVS puris.

CAP. VI.

HActenus de partibus miscellaneis datis : Sequuntur puræ.

1. *Pura sunt tres partes eiusdem generis data.Suntque aut tria latera data,& quæruntur anguli:aut tres anguli dati, & quæruntur latera.*

ADMONITIO.

2. *PVra quamuis simplicitate priores,ob difficultatem tamen earundem meritò hic posteriorem sortientur locum.*

3. *In triangulis Sphæricis primò, summa ex Logarithmis crurum subducta à summa ex Logarithmis aggregati & differentiæ semibasis & semidifferentiæ crurum,relinquit duplum Logarithmi dimidij anguli verticalis.*

quod Eis scrupulatur ex additio Semibasis et Semidifferentia crurum.
Semibasis enim et semidifferentia crurum invicem addu[ntur] ab invicem subtrahuntur.

Quia

Quia docent Regiomontanus libro 5. cap. 2. de triangulis, & alij, vt rectangulum comprehensum sub sinibus rectis crurum, se habet ad quadratum sinus totius: Ita differentiam sinuum versorum basis & differentiæ crurum se habere ad sinum versum anguli verticalis: quum autem vt illa differentia ad hunc sinum versum, ita rectangulum factum ex sinibus rectis aggregati & differentiæ semibasis & semidifferentiæ crurum, se habet ad quadratum sinus recti dimidij anguli verticalis (est enim nouissimum hoc rectâgulum ad illam differentiam sinuum versorum, & hoc vltimum quadratum ad illum sinum versum in ratione 5000000cupla, & intellige quinquies millies millecupla, existente sinu toto 10000000.) Ideo sequetur quod, vt rectangulum sub sinibus rectis crurum se habet ad quadratum sinus totius, ita rectangulum factum ex sinibus rectis aggregati & differentiæ semibasis & semidifferentiæ crurum, se habebit ad quadratum sinus recti dimidij anguli verticalis: & per consequens (ex corol. def.6.cap.1.& prop.4. cap. 2. & probl.3.cap.5.lib.1.) Summa ex Logarithmis crurum, subducta ex Logarithmis aggregati & differentiæ semibasis & semidifferentiæ crurum, relinquit duplum Logarithmi dimidij anguli verticalis, vt suprà.

4. *Secundò, Summa ex Logarithmis crurum subducta à summa ex Logarithmis aggregati & differentiæ semibasis & semiaggregati crurum, relinquit duplum antilogarithmi dimidij anguli verticalis.*

Non enim aliter se habet summa ex Logarithmis aggregati & differentiæ semibasis & semiaggregati crurum huius propositionis, ad summam ex Logarithmis aggregati & differentiæ semibasis & semidifferentiæ crurum præcedentis propositionis, quàm duplum antilogarithmi dimidij anguli verticalis hîc, ad duplum logarithmi eiusdem dimidij anguli verticalis superius, quod alterius loci est demonstrare.

ADMO

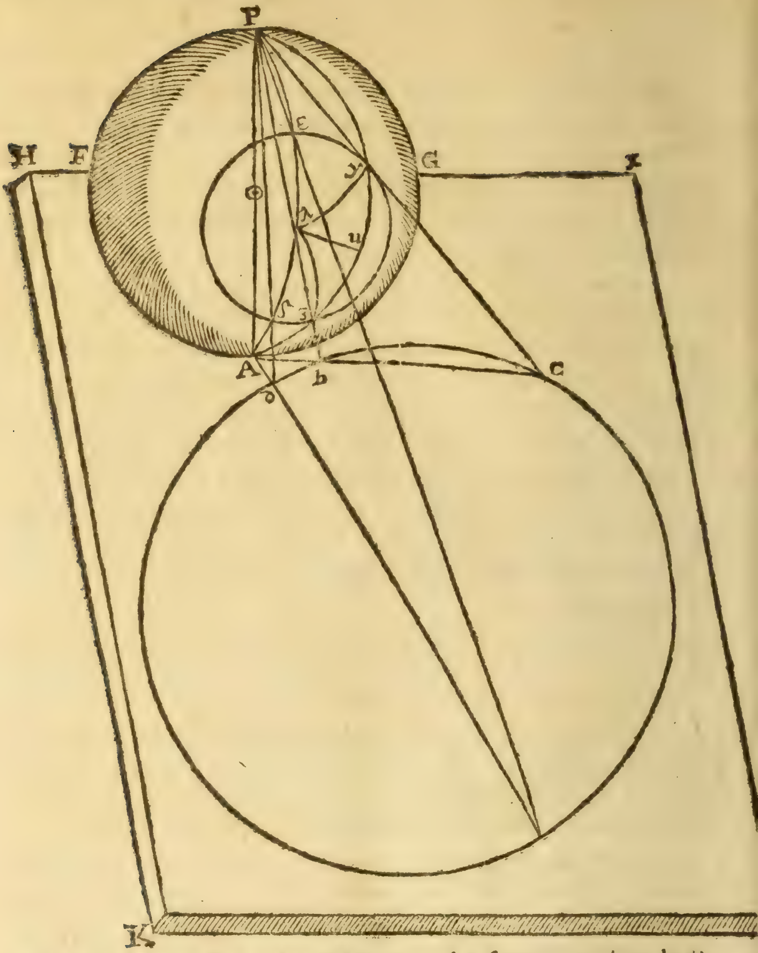
ADMONITIO.

5. *IN Sphericis etiam, bases veram & alternam, eodem sensu capimus, quo in rectilineis, nimirum alteram pro aggregato, alteram pro differentia casuum.*

6. *Tertiò differentialis semibasis veræ datæ, subductus ex summa differentialium semiaggregato & semidifferentiæ crurum, relinquit differentialem semibasis alternæ.*

Huius ratio fundamentalis est, quòd vt tangens semibasis veræ se habet ad tangentem semiaggregati crurum, ita tangens semidifferentiæ crurum se habeat ad tangentem semibasis alternæ. Tangentium enim logarithmi sunt suorum arcuum differentiales per sect. 22. & 25. cap. 3. lib. 1. Vnde hāc tangentium analogiam sequetur illa suorum logarithmorum, seu differentialium æqualitas per prop 4. cap. 2. lib. 1. Verùm quia huius analogiæ tangentium fundamentalis, hactenus ignotæ, demonstrationem à me fortè requirent Lectores, eam ideo, quantum huius compendij breuitas patitur, hîc explicabimus.

Sphæra itaque A F P G incumbat plano H I K Q, vt se inuicem tangant in communi puncto A, à quo per Sphæræ centrum Θ erigatur recta A Θ P secans supremum Sphæræ Hemisphærium in puncto P, eritque ita A Θ P perpendicularis plano H I K Q. deinde angulo A describatur in Sphæræ superficie triangulum A λ γ in γ acutum, aut A λ β in β obtusum, & protractis semicirculis A λ P, & A γ P, seu A β P, polo λ, interuallo λ γ, seu ei æquali λ β ducatur circulus ι δ β γ, secans λ P in ι & λ A in δ & A β γ in punctis β & γ. Ex puncto λ in arcum A β γ dimittatur perpendicularis arcus λ μ. Erunt itaque hîc A λ crus maius, λ γ vel λ β crus minus, A γ & A β bases, altera vera, reliqua alterna, A δ differentia crurum, & A ι aggregatum crurum, quia λ ι, & λ δ ex constructione sunt æqualia minori cruri λ γ seu λ β. His peractis, & supposito P vicem gerere oculi aut lucidi cuiuspiam, ab eodem P in subiectum planum H I K Q dimittantur, radius P γ secans planum in C, & radius P β secans planum in b; &



quia γ β A in eodem plano ſeu circulo ſunt cum lucido P, erunt ſuæ vmbræ c b A in eadem recta. Similiter ab eodem puncto P. in idem planum dimittantur radius P ε ſecans planum in e, & radius P δ ſecans planum in d. & quia ε δ A in eodem ſunt plano & circulo cum lucido P; ideo ſuæ vmbræ e d A erunt in eadem recta. Præterea quia P Θ A, eſt plano orthogonalis ſeu rectangula, ideo triangula P. A. d. & P. A. e, atque

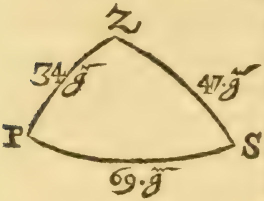
que P A b, & P A c sunt in A recta gula, atque ideo etiam A d est tangens anguli A P δ, seu A P. d, & A e est tangens anguli A P ε vel A P e sic etiam A b est tangens anguli A P β vel A P b, & A c est tangens anguli A P γ vel A P c, posito gnomone seu sinu toto P A, & quia A d est tangens anguli A P δ, & A P δ est dimidium anguli A Θ δ per 20. prop. 3 Eucl. (quod hîc fit in centro, ille in circumferentia) ideo A d est tangens dimidij anguli A Θ δ, seu (quod idem est) dimidij arcus A δ, quod est semidifferentia crurum. Similiter quia A e est tangens anguli A P ε, angulus autem A P ε in circumferentia sit dimidium anguli A Θ ε in centro, ideo A e est tangens dimidij A Θ ε, seu dimidij arcus, A ε, quod est semiaggregatum crurum. Simili modo in basibus vera & alterna erit A b tangens anguli A P β, seu dimidij anguli A Θ β, seu dimidij arcus A β, quod est altera semibasis: atque A c erit tangēs anguli A P γ seu dimidij anguli A Θ γ, seu dimidij arcus A γ quod est reliqua semibasis. Quumque jam ostensum sit quod A b sit tangens alterius semibasis & A c tangens reliquæ semibasis, atque A d sit tangens semidifferentiæ crurum, & A e tangens semiaggregati crurū. Dico quod vt A b tangens semibasis veræ se habet ad A e tangentem semiaggregati crurum, ita A d tangens semidifferentiæ crurum ad A c tāgentem semibasis alternæ: vel contrà ex alterna veram faciendo, vt A c tangens semibasis veræ se habeat ad A e tangentem semiaggregati crurum: Ita A d tangens semidifferentiæ crurum ad A b tangentem semibasis alternæ. Quod sic probo. Si puncta b c d e sint in eodem circulo, erit (per 36 prop. 3 & 16. prop. 6. Euclid.) vt A b ad A e Ita A d ad A c. & contrà, &c vt jam diximus. Verùm puncta b c d e cadunt in eodem circulo: Omnis enim circuli in superficiæ Sphæræ descripti vmbra à lucido in eadem superficie, quod non est in circuli peripheria procedens circulum facit perfectè rotundum in plano orthogono ad rectam, quæ à lucido per centrum Sphæræ progreditur, vt ex Opticis & astrolabij fabrica patet. At hic circulus δ β γ ε in sphæræ superficie describitur, & lucidum P. est extra circuli peripheriam, quæque ab eo procedit recta per cētrum (videlicet P Θ A) est ad planum orthogona. Necessariò ergo eius circuli vmbra, quæ in puncta d. b. c. e. incidit, circularis est: & perfectè rotunda.

Ergo vt se habent A.b.ad A.e.Ita A.d.ad A.c. & contra, id est, vt tangens semibasis veræ ad tangentem semiaggregati crurũ, ita tangens semidifferentiæ crurum ad tangentem semibasis alternæ:& per consequens, differentialis semibasis veræ, subductus ex summa differentialium semiaggregati, & semidifferentiæ crurum, æquatur differentiali semibasis alternæ, quæ demonstranda suscepimus.

7. *Vnde trianguli Sphærici datis tribus lateribus, habetur triplici modo angulorum quiuis.*

8. *Primus modus est, vt latus quoduis (præcipuè quadranti proximum) pro basi statuas. Inde semidifferentiam crurum, & ad semibasim addas, & à semibasi subtrahas: producti & residui Logarithmos addas, hinc auferas aggregatum ex Logarithmis crurum, reliqui bipartiti Logarithmi arcum duplices, & proueniet angulus verticalis, atque ita cæteri.*

Vt trianguli P Z S repetiti, dentur latera P Z 34 gr.& Z S 47 gr.& S P 69 gr. Quærantur anguli, primóque quadranti proximus P Z S angulus, quam S P 69 (latus scilicet quadranti proximum) subtendit. Hoc itaque S P 69 pro basi statuatur. Inde semidifferentiam crurum P Z, & Z S, videlicet 6.30. Et adde ad semibasim 34. 30. fientque 41 aggregatum: & substrahe ab ea, fientque 28. residuum.



Logarithmos graduum 41 scilicet 4215044, & graduum 28, scilicet 7561472 adde, fient 11776516. Similiter crurum P.Z.34, & Z S. 47. Logarithmos 5812606, & 3128580 adde, fientque 8941186. quibus ex 11776516 ablatis, fient 2835330: cuius dimidio logarithm. 1417665. respondentem arcum, videlicet 60. 12′. 24″ ½ duplica, prouenient 120.24′ 49″ angulus verticalis P.Z.S. quæsitus. Nec secus angulos reliquos, si libet, inuenire poteris: facilius tamen per 9. cap 5 huius innotescent, quia per 2. sentẽt. cap. 3. sunt certæ speciei.

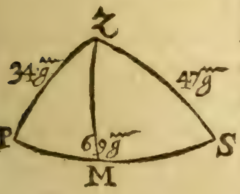
9. *Secundus modus est, vt latere quouis (præcipuè quadranti proximo) pro basi statuto, Semi-basim & ad semiaggregatum crurum addas, & ab eodem substrahas: producti & residui Logarithmos addas & hinc*

& hinc auferas aggregatum ex logarithmis crurum, reliqui bipartiti antilogarithmi arcum duplices, & proueniet inde angulus verticalis: atque ita cæteri.

Vt eiusdem trianguli P.Z.S. (constituti vt in præmissa) semibasim 34.30′ & ad semiaggregatum crurum 40.30′ adde, fientque 75. & ab eodem substrahe, fientque 6, quorum 75 & 6 graduum logarith. 346683, & 2258295 1 adde, fientque 2292963 4. Hinc aufer aggregatum ex logarithmis crurum, quod (vt supra) est 8941186, fientque 13988448. Quæ bipartire, fient inde 6994224 antilogarithmus conueniens arcui 60. 12′. 24″$\frac{1}{2}$. cuius duplum 120.24′. 49″. est (vt supra) quæsitus angulus P Z S verticalis. Cæteros licet etiam hoc modo, facilius tamen per 9. cap. 5. huius inuenies angulos. Sunt enim per 2. sent. cap. 3. notę speciei.

10\. *Tertius modus est, vt latere quovis pro basi posito, differentialem semi-aggregati crurum ad differentialem semi differentiæ crurum addas, & à producto auferas differentialem semi-basis veræ, & proueniet inde differentialis semibasis alternæ: quarum semibasium summa est casus maior, & differentia casus minor, duo distinguentes rectangula, quæ & suas, & ipsius oblati trianguli partes omnes (per nonam cap. 4. & octauam cap. 5. huius) notas reddunt.*

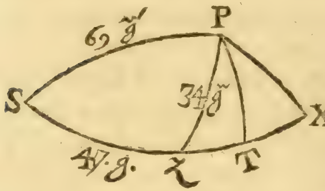
Vt propositi trianguli P. Z. S. datis lateribus vt supra, quærātur anguli apud basim Z P S. & Z S P. Semi-aggregatum crurum P Z. & Z S. est 40. 30′. Semidifferentia crurum est 6. 39′. Illius differentialis est 1577296. huius verò est 21721209. Quos adde, fient 23298505. Hinc aufer semibasis veræ 34.30′ differentialem 3750122, remanent 19548383, differentialis 8. 3′. 31″. pro semibasi alterna. adde ergo semibases 34.30′. & 8. 3′. 31″. fient inde 42. 33′. 31″. pro maiore casu M S. & substrahe 8. 3′. 31″. à 34.30′ relinquentur 26. 26′ 29″. pro minore casu P M. horum itaq; casuum officio habes duo jam rectangula in M. scilicet P M Z, & S M Z: quæ & perpendicularem Z M, & angulos verticales P Z M, & S Z M, aut, si libet, ipsum P Z S. patefaciunt (per nonam cap. 4 & octauam cap. 5. huius.) Sed his omissis ad quæsitos basis angulos Z P S, & Z S P, redeamus. Casus P M, 26, 26′, 29″. iam acquisiti differen



ferentialem 6985518 (per 9.cap.4.) adde ad differentialem complementi P Z scilicet ad differentialem 56 qui est — 3937709, prouenient †3047809 Logarithmi complementi anguli Z P S, quod complementum est 47.30'.1". Similiter casus S M, 42 31'.51", jam etiam acquisi differentialem 853239 (per eandem nonam sect.) adde ad differentialem complementi P Z scilicet ad differentialem 43 gr. qui est 698698 prouenient †1551937 Logarithmus complementi anguli Z S P, quod complementum est 58. 53'.55" Memor autem hîc sis non ipsas partes P Z. 34. & Z P S, aut P Z 47. & Z S P, sed sua complementa, viz. 56 gr. & 47.30'.1". & 43 gr. & 58 53'.55". circulares partes hic dici per secundam cap. 4. huius. Verus itaque angulus quæsitus Z P S est 42.29'.59" & Z S P est 31.6'.5". vt etiam ex sect octaua cap.5. huius patet.

Aliud eiusdem trianguli exemplum.

EOdem triangulo P Z S. alio situ constituto, sit S Z basis, & datis lateribus vt supra, quæratur angulus P. Z. S. Crurum itaque S. P. 69. & P Z. 34. semi-aggregatum est 51.30'. eiusque differentialis — 2288650: semidifferentia verò est 17.30', eiusque differentialis est † 1542341. Quos differentiales adde erit summa † 9253691. à qua aufer differentialem dimidii basis S Z videlicet differẽtialem 23.30'. qui est 8328403, remanebit 925288



differentialis arcus 42.21'11". pro semi-basi alterna. Adde ergo semi-bases 42.21'11" & 23.30'. prouenient 65.51'. 11". pro maiore casu S T. & tum subtrahe 23.30'. à 42.21'. 11". remanent 18.51'. 11". pro minore casu T X, vel T Z. Huius ergo differentialẽ † 10745201, adde ad differentialem complementum Z P, scilicet ad differentialem grad. 56, qui est — — 3937709 & prouueniet inde † 6807492 Logarithmus complementi anguli P Z T. Arcus autem in tabula respondens huic Logarithmo 6807492 ex aduerso est graduum 56.35' 11". pro angulo P Z T, cuius anguli P Z T, quam angulus quæsitus P Z S, sit ad semi circulum reliquus (quod semper occurrit quam basis alterna est maior vera) erit necesse P Z S. esse graduum 120.24.min.49.sec. alioquin si basis ve

sis vera alternam superauerit, coincident anguli P Z T, & P Z S, & æquales erunt.

ADMONITIO.

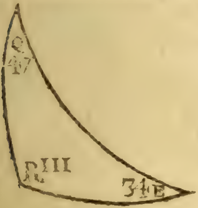
TRes iam habes veros modos inueniendi angulos ex datis lateribus, quorum vnoquoque tres variæ soluuntur huius, & cuiuscunque trianguli quæstiones. Ex datis enim eleuatione poli, altitudine solis, & declinatione solis, dubitantibus satisfit ad quæstionem qua vel plaga solis, vel secundò angulus situs & positionis solis, vel tertiò hora diei quæritur.

Hac vsque ex lateribus inuenimus angulos. Superest ex angulis inuenire latera.

11. *In omni triangulo sphærico mutari possunt latera in angulos, & anguli in latera: assumpto tamen prius pro vnico quouis angulo, & sue subtendente latere suis ad semicirculum reliquis.*

Exempli gratia.

Esto triangulum Q R T cuius sint anguli Q 47. R 111. & T 34. Sumamus primò pro angulo quouis, videlicet pro R 111. suum ad semicirculum reliquum, quod est 69. grad. Dico hos angulos 47. 69. & 34. mutari posse in latera, & fiet superius triangulum P Z S. In quo P Z. est 34 grad. Z S. est 47 grad. & P S est 69 grad. vt etiam ex illius trianguli, P Z S, angulis, fient huius tantò latera. Nam Z S P angulus grad. 31. 2′. 6″. illius, est latus Q R huius: & angulus Z P S. grad 42. 29′. 59″. illius est latus R T huius: & tertij anguli illius, qui est grad. 120 24′. 49″. reliquum ad semi-circulum, quod est 59 35′ 11″ est latus Q T huius. Cuius rei demonstrationem exhibent Bartholomæus Pitiscus Adrianus Metius, & alij. Eam igitur hac epitome minimè repetendam censeo.



12. *Vnde trianguli Sphærici datis tribus angulis, facili conuersione acquiruntur latera.*

Vt præcedentis trianguli Q R T dentur anguli Q 47. R 111. & T 34. Quærantur autem latera. Pro angulo quouis vnico, verbi gratia (vt supra) pro R 111. sumatur suum ad semicirculum reliquum 69. grad. Inde positis 47. 69. & 34. pro lateribus,

vt in

vt in triangulo superiore P Z S factum est, per quemuis ex tribus modis suprascriptis quære illius angulos, & inuenies contra latus 47, angulum 42.29′ 59″: & contra latus 34, angulum 31. 6.″5. & contra latus 69 (quod pro 111 posuimus) reperies angulum 120.24′ 49″. Ideo in triangulo oblato Q R T, pro latere R T. subtendente angulum Q 47, pone 42. 29′. 59″ Et pro latere Q R. subtendente angulum T. 34, pone 31.6′ 5″ verùm pro latere Q T subtendente angulum R 111 pone 59 35′ 11. quæ sunt reliquum graduum 120.24′.4″.ad semi-circulum reliquum, scilicet 69. Et ita ex angulis per conuersionem acquires latera.

ADMONITIO.

EX hac laterum per angulos datos inuentione tres variæ soluuntur huius, & cuiuscunque trianguli quæstiones. Vt in triangulo P Z S. Ex datis, hora diei, plaga solis, & angulo situs vel positionis solis, hæc præcedens sati. facit quæstioni, qua vel primò eleuatio poli, vel secundò altitudo solis. vel tertiò declinatio solis quæratur. Ex octaua itaque sect. præcedentis cap. 5. & septima ac duodecima huius, sexaginta habes variarum quæstionum solutiones, quæ in quodque triangulum cadunt. Nec his plures ex multiplici trium quarumlibet. partium compositione oriri possunt variationes. Perfectam igitur habes, & absolutam triangulorum tam Sphæricorum, quam planorum doctrinam.

CONCLVSIO.

SAtis ergo iam ostensum est quod sint, quid sint, & cuius vsus sint Logarithmi: Eorum enim beneficio absque multiplicationis, diuisionis, aut radicum extractionis molestia, omnis Geometricæ quæstionis solutionem logisticam promptissimè exhiberi, tum apodeicticè demonstrauimus, tum exemplis vtriusque Trigonometriæ docuimus. Promissum itaque mirificum Logarithmorum *canonem habetis, eiusque amplissimum vsum: quæ si vobis eruditioribus grata fore ex rescriptis vestris intellexero, animus mihi addetur, ad tabulæ condendæ methodum in lucem etiam proferendam.* Interim *hoc breui opusculo fruamini, Deoque opifici summo, omniumque operum bonorum opitulatori laudem summam & gloriam tribuite.*

SE

SEQVITVR TABVLA CANONIS LOGARITHMORVM seu ARITHMETICARVM SVPPVTATIONVM.

S'ensuit l'Indice du Canon des Logarithmes.

A SCAVOIR,

La Table de l'admirable inuention pour promptement & facilement *Abreger ses supputations, d'Arithmetique* auec son vsage, en l'vne & l'autre *Trigonometrie*, & aussi en toute *Logistique Mathematique.*

LVGDVNI,

Apud BARTHOL. VINCENTIVM.

Gr. 0

0

Min	Sinus	Logarithmi	+ | − Differentia	Logarithmi	Sinus	
0	0	Infinitum	Infinitum	0	10000000	60
1	2909	81425681	81425680	1	10000000	59
2	5818	74494213	74494211	2	9999998	58
3	8727	70439560	70439560	4	9999998	57
4	11636	67562746	67562739	7	9999993	56
5	14544	65331315	65331304	11	9999989	55
6	17453	63508099	63508083	16	9999986	54
7	20362	61966595	61966573	22	9999980	53
8	23271	60631284	60631256	28	9999974	52
9	26180	59453453	59453418	35	9999967	51
10	29088	58399857	58399814	43	9999959	50
11	31997	57446759	57446707	52	9999950	49
12	34906	56576646	56576584	62	9999940	48
13	37815	55776222	55776149	73	9999928	47
14	40724	55035148	55035064	84	9999917	46
15	43632	54345225	54345129	96	9999905	45
16	46541	53699843	53699734	109	9999892	44
17	49450	53093600	53093577	123	9999878	43
18	52359	52522019	52521881	138	9999863	42
19	55268	51981356	51981202	154	9999847	41
20	58177	51468431	51468361	170	9999831	40
21	61086	50980537	50980450	187	9999813	39
22	63995	50515342	50515137	205	9999795	38
23	66904	50070827	50070603	224	9999776	37
24	69813	49645239	49644995	244	9999756	36
25	72721	49237030	49236765	265	9999736	35
26	75630	48844826	48844539	287	9999714	34
27	78539	48467431	48467122	309	9999692	33
28	81448	48103763	48103431	332	9999668	32
29	84357	47752859	47752503	356	9999644	31
30	87265	47413852	47413471	381	9999619	30

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	87265	47413471	47413471	381	9999619	30
31	90174	47085554	47085554	407	9999593	29
32	93083	46768049	46768049	434	9999566	28
33	9599[illegible]	46460773	46460312	461	9999539	27
34	98901	46162254	46161765	489	9999511	26
35	101809	45872392	45871874	518	9999482	25
36	104718	45590688	45590140	548	9999452	24
37	107627	45316714	45316135	579	9999389	23
38	110536	45050041	45049430	611	9999389	22
39	113445	44790296	44789652	644	9999357	21
40	116353	44537132	44536455	677	9999323	20
41	119262	44290216	4428[illegible]05	711	9999289	19
42	122171	44049255	44048509	746	9999254	18
43	125079	43813959	43813177	782	9999218	17
44	127988	43584078	43583259	819	9999181	16
45	130896	43359360	43358503	857	9999143	15
46	133805	43139582	43138686	896	9999105	14
47	136714	42924534	42923599	935	9999065	13
48	139622	42714014	42713039	975	9999025	12
49	142531	42507833	42506817	1016	9998984	11
50	145439	42305826	42304768	1058	9998942	10
51	148348	42107812	42106711	1101	9998900	9
52	151257	41913644	41912499	1145	9998856	8
53	154164	41723175	41721986	1189	9998811	7
54	157075	41536271	41535037	1234	9998766	6
55	159982	41352795	41351515	1280	9998720	5
56	162891	41172626	41171299	1327	9998673	4
57	165799	41006643	41005268	1375	9998625	3
58	168708	40821746	40820322	1424	9998577	2
59	171616	40650816	40649343	1473	9998527	1
60	174524	40482764	40481241	1523	9998477	0
						min
						Gr.

min.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	174524	40482764	40481241	1523	9998477	60
1	177433	40317483	40315909	1574	9998426	59
2	180341	40154899	40153273	1626	9998374	58
3	183250	39994918	39993239	1679	9998321	57
4	186158	39837448	39835715	1733	9998267	56
5	189066	39682421	39680633	1788	9998212	55
6	191975	39529765	39527922	1843	9998157	54
7	194883	39379407	39377598	1899	9998101	53
8	197792	39231274	39229318	1956	9998044	52
9	200700	39085307	39083293	2014	9997986	51
10	203608	38941441	38936368	2073	9997927	50
11	206517	38799612	38797479	2133	9997867	49
12	209425	38659767	38657573	2194	9997806	48
13	212333	38521858	38519603	2255	9997745	47
14	215241	38385824	38383507	2317	9997683	46
15	218149	38251613	38249233	2380	9997620	45
16	221057	38119183	38116739	2444	9997556	44
17	223965	37988481	37985972	2509	9997491	43
18	226873	37859471	37856896	2575	9997425	42
19	229781	37732105	37729464	2641	9997359	41
20	232689	37606339	37603631	2708	9997292	40
21	235597	37482135	37479359	2776	9997224	39
22	238505	37359458	37356613	2845	9997155	38
23	241413	37238269	37235354	2915	9997085	37
24	244321	37118532	37115546	2986	9997014	36
25	247229	37000208	36997150	3058	9996943	35
26	250137	36883272	26889142	3130	9996871	34
27	253045	36767690	36764487	3203	9996798	33
28	255953	36653428	36650151	3277	9996724	32
29	258861	36540448	36537096	3352	9996649	31
30	261769	36428748	36425320	3428	9996573	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	261769	36428748	36425320	3428	9996573	30
31	264677	36318272	36314768	3504	9996496	29
32	267585	36209009	36205427	3582	9996419	28
33	270493	36100924	36097264	3660	9996341	27
34	273401	35994000	35990261	3739	9996262	26
35	276308	35888207	35884388	3819	9996182	25
36	279216	35783520	35779620	3900	9996101	24
37	282124	35679917	35755935	3982	9996019	23
38	285032	35577380	35573316	4064	9995937	22
39	287940	35475892	35471745	4147	9995854	21
40	290847	35375415	35371184	4231	9995770	20
41	293755	35275035	35271619	4316	9995685	19
42	296663	35177444	35173042	4402	9995599	18
43	299570	35079909	35075420	4489	9995512	17
44	302478	34983320	34978743	4577	9995424	16
45	305375	34887652	34882987	4665	9995336	15
46	308293	34792895	34788141	4754	9995247	14
47	311200	34699029	34694185	4844	9995157	13
48	314108	34606036	34601101	4935	9995066	12
49	317015	34513899	34508872	5027	9994974	11
50	319922	34422606	24417486	5120	9994881	10
51	322830	34332140	34326926	5214	9994787	9
52	325737	34242484	34237176	5308	9994693	8
53	328645	34153629	34148226	5403	9994598	7
54	331552	34076549	34071050	5499	9994502	6
55	334459	33978246	33972650	5596	9994405	5
56	337367	33891701	33886007	5694	9994307	4
57	340274	33805893	33800100	5793	9994208	3
58	343181	33720820	33714927	5893	9994109	2
59	346088	33636464	33630471	5993	9994009	1
60	348995	33552817	33546723	6094	9993908	0
						mi.

2 min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	348995	33552817	33546723	6094	9993908	60
1	351902	33469860	33463664	6196	9993806	59
2	354809	33387588	33381289	6299	9993703	58
3	357716	33305993	33299590	6403	9993599	57
4	360623	33225056	33218549	6507	9993495	56
5	363530	33144770	33138158	6612	9993490	55
6	366437	33065128	33058410	6718	9993284	54
7	369344	32986107	32979282	6825	9993177	53
8	372251	32907712	32900779	6933	9993069	52
9	375158	32829923	32422881	7042	9992960	51
10	378064	32752740	32745588	7152	9992850	50
11	380971	32676149	32668887	7262	9992740	49
12	683878	32600139	32592866	7373	9992629	48
13	386785	32524706	32517221	7485	9992517	47
14	389692	32449837	32442239	7598	9992404	46
15	392598	32375526	32367814	7712	9992290	45
16	395505	32301761	32293934	7827	9992175	44
17	398412	32228539	32220596	7943	9992060	43
18	401318	32155852	32147793	8059	9991944	42
19	404225	32083692	32075516	8176	9991827	41
20	407131	32012045	32003751	8294	9991709	40
21	410038	31940909	31932496	8413	9991590	39
22	412944	31870276	31861743	8533	9991470	38
23	415851	31800141	31791887	8654	9991349	37
24	418757	31730492	31721716	8776	9991228	36
25	421663	31661332	31652434	8898	9991106	35
26	424570	31592644	31583623	9021	9990983	34
27	427476	31524424	31515279	9145	9990859	33
28	430382	31456672	31447402	9270	9990734	32
29	433288	31289371	21379975	9396	9990608	31
30	436194	31322524	31313001	9523	9990482	30

min	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	436194	31322524	31313001	9523	9990482	30
31	439100	31256121	31246471	9650	9990355	29
32	442006	31190158	31180380	9778	9990227	28
33	444912	31124626	31114719	9907	9990098	27
34	447818	31059521	31049484	10037	9989968	26
35	450724	30994841	30984673	10168	9989837	25
36	453630	30930577	30920277	10300	9989706	24
37	456536	30866722	30856290	10432	9989574	23
38	459442	30803277	30792712	10565	9989441	22
39	462348	30740230	30729531	10699	9989307	21
40	465253	30677578	30666744	10834	9989172	20
41	468159	30615317	30604347	99870	9989036	19
42	471065	30553442	30542335	11107	9988899	18
43	473970	30491949	30480704	11245	9988761	17
44	476876	30430834	30419451	11383	9988623	16
45	479781	30370090	30358568	11522	9988484	15
46	482687	30309715	30298053	11662	9988344	14
47	485562	30249702	30237899	11803	9988203	13
48	488498	30190049	30178104	11945	9988601	12
49	491403	30130749	30118661	12088	9987918	11
50	494308	30071797	30059565	12232	9987775	10
51	497214	30013193	30000817	12376	9987631	9
52	500119	29954933	29942412	12521	9987486	8
53	503024	29897014	29884347	12667	9987340	7
54	505929	29839424	29826610	12814	9987193	6
55	508834	29782165	29769203	12962	9987045	5
56	511740	29725236	29712125	13111	9986897	4
57	514645	29668628	29655367	13261	9986748	3
58	517550	29612331	29598920	13411	9986598	2
59	520455	29556458	29542796	13562	9986447	1
60	524360	29500706	29486992	13714	9986295	0
						mi. Gr. 87

†|—

min 3	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	523360	29500706	29486992	13714	9986295	60
1	526265	29445354	29431487	13867	9986143	59
2	529170	29390307	29376286	14021	9985989	58
3	532075	29335565	29321389	14176	9985835	57
4	534980	29281122	29266791	14331	9985680	56
5	537884	29226973	29212486	14487	9985524	55
6	540789	29173115	29158471	14644	9985367	54
7	543694	29119548	29104746	14802	9985209	53
8	546598	29066270	29051309	14961	9985050	52
9	549503	29013273	28998152	15121	9984891	51
10	552407	28960557	28945276	15281	9984731	50
11	555312	28908117	28892675	15442	9984570	49
12	558216	28855951	28850347	15604	9984408	48
13	561120	28804057	28788290	15767	9984245	47
14	564024	28752430	28736499	15931	9984081	46
15	566928	28701071	28684975	16096	9983917	45
16	569832	28649975	28633714	16261	9983752	44
17	572736	28599142	28582715	16427	9983586	43
18	575640	28548570	28531976	16594	9983419	42
19	578544	28498247	28481485	16762	9983251	41
20	581448	28448177	28431246	16931	9983082	40
21	584352	28398354	28381253	17101	9982912	39
22	587256	2834[illegible]782	28331510	17272	9982742	38
23	590160	28299459	2828201	17444	9982571	37
24	593064	28250377	28232761	17616	9982399	36
25	595967	28201535	28183746	17789	9982226	35
26	598871	28152930	28134967	17963	9982052	34
27	601775	28104561	28086423	18138	9981877	33
28	604678	28056428	28038114	18314	9981701	32
29	607582	28008424	27990033	18491	9981525	31
30	610485	27960848	27942178	17670	9981348	30

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	610485	27960848	27942178	18670	9981348	30
31	613389	27913400	27894552	18848	9981170	29
32	616292	27866180	27847153	19027	9980991	28
33	619196	27819184	27799977	19207	9980811	27
34	622099	27772408	27753020	19388	9980631	26
35	625002	27725848	27706278	19570	9980450	25
36	627905	27679504	27659752	19752	9980268	24
37	630808	27633374	27613439	19935	9980085	23
38	633711	27587457	27567338	20119	9979901	22
39	636614	27541753	27521449	20304	9979716	21
40	639517	27496257	27475767	20490	9979530	20
41	642420	27450968	27430291	20677	9979343	19
42	645323	27405885	27385020	20865	9979156	18
43	648226	27361003	27339950	21053	9978968	17
44	651129	27316323	27295081	21242	9978779	16
45	654031	27271843	27250411	21432	9978589	15
46	656934	27227563	27205940	21623	9978398	14
47	659837	27183476	27161661	21815	9978207	13
48	662739	27139581	27117573	22008	9978015	12
49	665642	27095878	27073676	22202	9977822	11
50	668544	27052373	27029976	22397	9977628	10
51	671447	27009057	26986465	22592	9977433	9
52	674349	26965926	26943138	22788	9977237	8
53	677251	26922980	26899995	22985	9977040	7
54	680153	26880218	26857035	23183	9976843	6
55	683055	26837639	26814257	23382	9976645	5
56	675957	26795243	26771661	23582	9976446	4
57	688859	26753027	26729244	23783	9976246	3
58	691761	26710988	26687003	23985	9976045	2
59	694663	26669126	26644939	24187	9975843	1
60	697565	26627442	26603052	24390	9975640	0
						min G.

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	697565	26627442	26603052	24390	9975640	60
1	700467	26585929	26561335	24594	9975437	59
2	703369	26544587	26519788	24799	9975233	58
3	706270	26503416	26478411	25005	9975028	57
4	709172	26462418	26437207	25211	9974822	56
5	712073	26421589	26396171	25418	9974615	55
6	714975	26380927	26355301	25626	9974408	54
7	717876	26340428	26314593	25835	9974200	53
8	720777	26300094	26284050	26044	9973991	52
9	723678	26259923	26233669	26254	9973781	51
10	726579	26219913	26193448	26465	9973570	50
11	729480	26180067	26153390	26677	9973358	49
12	732381	26140377	26113487	26890	9973145	48
13	735282	26100842	26073738	27104	9972931	47
14	738183	26061465	26034146	27319	9972717	46
15	741084	26022244	25994709	27535	9972502	45
16	743985	25983176	25955424	27752	9972286	44
17	746886	25944260	25916290	27970	9972069	43
18	749787	25905496	25877308	28188	9971851	42
19	752688	25866884	25838477	28407	9971633	41
20	755588	25828423	25799796	28627	9971414	40
21	758489	25790110	25751262	28848	9971194	39
22	761389	25751942	25722872	29070	9970973	38
23	764290	25713920	25684727	29293	9970751	37
24	767180	25676043	25646527	29516	9970528	36
25	770090	25638310	25608570	29740	9970304	35
26	772991	25600722	25570757	29965	9970079	34
27	775891	25563273	25533082	30191	9969854	33
28	778791	25525966	25495548	30418	9969628	32
29	781691	25488798	25458152	30646	9969401	31
30	784591	25451769	25420894	30875	9969173	30

min	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	784591	25451769	25420894	30875	9969173	30
31	787491	25414876	25383772	31104	9968944	29
32	790391	25378119	25346785	31334	9968715	28
33	793291	25341498	25309933	31565	9968485	27
34	796191	25305013	25273216	31797	9968254	26
35	799090	25268662	25236632	32030	9968022	25
36	801990	25232442	25200178	32264	9967789	24
37	804889	25196355	25163857	32498	9967555	23
38	807789	25160399	25127666	32733	9967320	22
39	810688	25124571	25091602	32969	9967085	21
40	813587	25088870	25055664	33206	9966849	20
41	816486	25053298	25019854	33444	9966612	19
42	819385	25017853	24984170	33683	9966374	18
43	822284	24982533	24948610	33923	9966135	17
44	825183	24947340	24913177	34163	9965895	16
45	828082	24912272	24877866	34404	9965655	15
46	830981	24877326	24842680	34646	9965414	14
47	833880	24842502	24807613	34889	9965172	13
48	836778	34807799	24772666	35133	9964929	12
49	839677	24773219	24737841	35378	9964685	11
50	842575	24738761	24703138	35623	9964440	10
51	845474	24704420	24668551	35869	9964194	9
52	848372	24670196	24634080	36116	9963948	8
53	851271	24636090	24599726	36364	9963701	7
54	854169	24602100	24565487	36613	9963453	6
55	857067	24568228	24531365	36863	9963204	5
56	859965	24534473	24497359	37114	9962954	4
57	862863	24500829	24463463	37366	9962703	3
58	865761	24467298	24429679	37619	9962452	2
59	868659	24433880	24396008	37872	9962200	1
60	871557	24400578	24362452	38126	9961947	0
						mi: Gr: 85

5 † | —

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	871557	24400578	24362452	38126	9961947	60
1	874455	24367384	24329003	38381	9961693	59
2	877353	24334102	24295665	38637	9961438	58
3	880250	24301329	24262435	38894	9961183	57
4	883148	24268467	24229316	39151	9960927	56
5	886045	24235712	24196303	39409	9960670	55
6	888943	24203064	24163396	39668	9960412	54
7	891840	24170523	24130595	39928	9960153	53
8	894737	24138089	24097900	40189	9959893	52
9	897634	24105760	24065309	40451	9959632	51
10	900531	24073540	24032827	40713	9959370	50
11	903428	24041422	24000446	40976	9959107	49
12	906325	24009408	23968168	41240	9958844	48
13	909222	23977495	23935990	41505	9958580	47
14	912119	23945985	23903914	41771	9958315	46
15	915016	23913978	23871940	42038	9958049	45
16	[illegible]1791	23882373	23840067	42306	9957782	44
17	920809	23850867	23808292	42575	9957515	43
18	923706	23819460	23776615	42845	9957247	42
19	926602	23788153	23745038	43115	9956978	41
20	929498	23756943	23713557	43386	9956708	40
21	932395	23725832	23682174	43658	9956437	39
22	935291	23694818	23650887	33931	9956165	38
93	93818[illegible]	23663900	23619695	44205	9955893	37
24	941083	23633080	23588601	44479	9955620	36
25	943979	23602355	23557601	44754	9955346	35
26	946875	23571725	23526695	45030	9955071	34
27	949771	23541190	23495882	45307	9954795	33
28	952667	23510748	23465163	45585	9954518	32
29	955562	23480[illegible]99	23434535	45864	9954240	31
30	958458	23450143	2340[illegible]999	46144	9953962	30

5

min	Sinus	Logarithmi	+ | − Differentia	Logarithmi	Sinus	
30	958458	23450143	23403999	46144	9953962	30
31	961354	23419980	23373556	46424	9953683	29
32	964249	23389908	23343203	46705	9953403	28
33	967144	23359927	23312940	46987	9953122	27
34	970039	23330036	23282766	47270	9952840	26
35	972934	23300235	23252681	47554	9952557	25
36	975829	23270525	23222686	47839	9952274	24
37	978724	23240903	23192778	48125	9951990	23
38	981619	23211368	23162956	48412	9951705	22
39	984514	23181920	23133220	48700	9951419	21
40	987408	23152560	23103572	48988	9951132	20
41	990303	23123287	23074010	49277	9950844	19
42	993198	23094100	23044533	49567	9950555	18
43	996092	23064999	23015141	49858	9950266	17
44	998987	23035985	22985836	50149	9949976	16
45	1001881	23007056	22956615	50441	9949685	15
46	1004775	22978212	22927478	50734	9949393	14
47	1007669	22949449	22898421	51028	9949100	13
48	1010563	22920769	22869446	51323	9948807	12
49	1013457	22892172	22840553	51619	9948513	11
50	1016351	22863658	22811742	51916	9948218	10
51	1019245	22835227	22783013	52214	9947922	9
52	1022139	22806878	22754366	52512	9947625	8
53	1025032	22778609	22725798	52811	9947327	7
54	1027926	22750420	22697309	53111	9947028	6
55	1030819	22722311	22668899	53412	9946729	5
56	1033713	22694283	22640569	53714	9946429	4
57	1036606	22666333	22612316	54017	9946128	3
58	1039499	22638461	22584140	54321	9945826	2
59	1042392	22610667	22556041	54626	9945523	1
60	1045285	22582951	22528019	54932	9945219	0
						mi.

min	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
0	1045285	22582951	22528019	54932	9945219	60
1	1048178	22555313	22500075	55238	9944914	59
2	1051071	22527752	22472207	55545	9944909	58
3	1053964	22500267	22444414	55853	9944303	57
4	1056857	22472859	22416697	56162	9943996	56
5	1059749	22445527	22389055	56472	9943688	55
6	1062642	22418272	22361490	56782	9943379	54
7	1065534	22391091	22333998	57093	9943069	53
8	1068426	22363984	22306579	57405	9942759	52
9	1071318	22336951	22279233	57718	9942448	51
10	1074210	22309991	22251959	58032	9942136	50
11	1077102	22283104	22224757	58347	9941823	49
12	1079994	22256290	22197627	58663	9941509	48
13	1082886	22229549	22170570	58979	9941194	47
14	1085778	2220288	22143585	59296	9940879	46
15	1088669	22176285	22116671	59614	9940563	45
16	1091561	22149762	22089829	59933	9940246	44
17	1094452	22123308	22063055	60253	9939928	43
18	1097344	22096925	22036351	60574	9939609	42
19	1100235	22070612	22009717	60895	9939290	41
20	1103126	22044368	21983151	61217	9938970	40
21	1106017	22018195	21956655	61540	9938649	39
22	1108908	21992090	21930226	61864	9938327	38
23	1111799	21966054	21903865	62189	9948004	37
24	1114690	21940086	21877571	62515	9937680	36
25	1117580	21914186	21851344	62842	9937355	35
26	1120471	21888355	21825185	63170	9937029	34
27	1123361	21862590	21799091	63499	9936703	33
28	1126252	21836892	21773064	63828	9936376	32
29	1129142	21811261	21747103	64158	9936048	31
30	1132032	21785693	21721209	64489	9935719	30

6

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	1132032	21785698	21721209	64489	9935719	30
31	1134922	21760199	21695378	64821	9935389	29
32	1137812	21734767	21669613	65154	9935058	28
33	1140702	21709400	21643912	65488	9934727	27
34	1143592	21684100	21618278	65822	9934395	26
35	1146482	21658865	21592708	66157	9934062	25
36	1149372	21633695	21567202	66493	9933728	24
37	1152261	21608586	21541756	66830	9933393	23
38	1155151	21583540	21516372	67168	9933057	22
39	1158040	21558557	21491050	67507	9932721	21
40	1160929	21533639	21465793	67846	9932384	20
41	1163818	21508781	21440595	68186	9932046	19
42	1166707	21483986	21415459	68527	9931707	18
43	1169596	21459254	21390385	68869	9931367	17
44	1172485	21434585	21365373	69212	9931026	16
45	1175374	21409979	21340423	69556	9930685	15
46	1178263	21385434	21315533	69901	9930343	14
47	1181151	21360949	21290702	70247	9930000	13
48	1184040	21336524	21265931	70593	9929656	12
49	1186928	21312160	21241220	70940	9929311	11
50	1189816	21287855	21216567	71288	9928965	10
51	1192704	21263609	21191972	71637	9928618	9
52	1195592	21239423	21167436	71987	9928271	8
53	1198480	21215297	21142959	72338	9927929	7
54	1201368	21191230	21118540	72690	9927574	6
55	1204255	21167222	21094179	73043	9927224	5
56	1207143	21143273	21069877	73396	9926873	4
57	1210031	21119381	21045631	73750	9926521	3
58	1212918	21095546	21021441	74105	9926169	2
59	1215806	21071769	20997308	74461	9925816	1
60	1218693	21048049	20973231	74818	9925461	0
						mi. Gr.

Gr. 7

7

min	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
0	1218693	21048049	20973231	74818	9925461	60
1	1221580	21024385	20949209	75176	9925106	59
2	1224467	21000779	20925245	75534	9924750	58
3	1227354	20977230	20901337	75893	9924393	57
4	1230241	20953738	20877485	76253	9924036	56
5	1233128	20930302	20853688	76614	9923678	55
6	1236015	20906922	20829946	76976	9923319	54
7	1238901	20883595	20806256	77339	9922959	53
8	1241788	20860323	20782620	77703	9922 59	52
9	1244674	20837106	20759038	78068	9922230	51
10	1247560	20813945	20735512	78433	9921874	50
11	1250446	20790838	20712039	78799	9921511	49
12	1253332	20767785	20688619	79166	9921147	48
13	1256218	20744785	20665251	79534	9920782	47
14	1259104	20721838	20641935	79903	9920416	46
15	1261990	20698946	20618946	80272	9920049	45
16	1264876	20676107	20595465	80642	9919682	44
17	1267761	20653321	20572308	81013	9919314	43
18	1270647	20630588	20549203	81385	9918945	42
19	1273532	20607906	20526148	81758	9918575	41
20	1276417	20585278	20503146	82132	9918204	40
21	1279302	20562701	20480194	82507	9917832	39
22	1282187	20540176	20457293	82883	9917459	38
23	1285072	20517703	20434444	83259	9917086	37
24	1287957	20495281	20411645	83636	9916712	36
25	1290841	20472909	20388895	84014	9916337	35
26	1293726	20450587	20366194	84393	9914828	34
27	1296610	20428316	20343543	84773	9915584	33
28	1299494	20406096	20320942	85154	9915206	32
29	1302378	20383925	20298389	85536	9914828	31
	1305262	20361806	20275887	85919	9914443	30

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	1305262	20361806	20275887	85919	9914449	30
31	1308146	20339737	20253435	86302	9914069	29
32	1311030	20317717	20231031	86686	9913688	28
33	1313914	20295746	20208675	87071	9913306	27
34	1316798	20273822	20186365	87457	9912923	26
35	1319681	20251947	20164103	87844	9912540	25
36	1322564	20230120	20141888	88232	9912156	24
37	1325447	20208341	20119720	88621	9911771	23
38	1328330	20186611	20097600	89011	9911385	22
39	1331213	20164931	20075530	89401	9910998	21
40	1334096	20143301	20053509	89792	9910610	20
41	1336979	20121717	20031533	90184	9910221	19
42	1339862	20100180	20009603	90577	9909832	18
43	1342744	20078689	19987718	90971	9909442	17
44	1345627	20057245	19965880	91365	9909051	16
45	1348509	20035846	19944086	91760	6908659	15
46	1351392	20014494	19922338	92156	9908266	14
47	1354274	19993189	19900036	92553	9907873	13
48	1357156	19971931	19878980	92951	9907479	12
49	1360038	19950718	19857368	93350	9907084	11
50	1362920	19929552	19829852	63750	9906688	10
51	1365802	19908432	19814281	94151	9906291	9
52	1368683	19887357	19792805	94552	9905893	8
53	1371564	19866327	19771373	94954	9905494	7
54	1374446	19845341	19749984	95357	9905095	6
55	1377327	19824400	19728639	95761	9904695	5
56	1380208	19803504	19707338	96156	9904294	4
57	1383089	19782652	19686080	96572	9903892	3
58	1385970	19761844	19664865	96979	9903489	2
59	1388851	19741081	19643694	97387	9903085	1
60	1391731	19720362	19622566	97796	9902681	0
						mi.

min.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	1391731	19720362	19622566	97796	9902681	60
1	1394612	19699687	19601482	98205	9902276	59
2	1397492	19679054	19580439	98615	9901870	58
3	1400373	19658464	19559438	99026	9901463	57
4	1403253	19637917	19538479	99438	9901055	56
5	1406133	19617413	19517562	99851	9900646	55
6	1409013	19596952	19496687	100265	9900237	54
7	1411893	19576535	19475756	100679	9899827	53
8	1414772	19556160	19455066	101094	9899416	52
9	1417652	19535827	19434317	101510	9899004	51
10	1420531	19515538	19413611	101927	9898591	50
11	1423410	19495290	19392945	102345	9898177	49
12	1426289	19475084	19372320	102764	9897762	48
13	1429168	19454918	19351734	103184	9897347	47
14	1432047	19434794	19331190	103604	9896931	46
15	1434926	19414711	19310686	104025	9896514	45
16	1437805	19334669	19290222	104447	9899096	44
17	1440684	19374668	19269798	104870	9895677	43
18	1443562	19354708	19249414	105294	9895257	42
19	1446441	19334787	19229068	105719	9894837	41
20	1449319	19314908	19208763	106145	9894416	40
21	1452197	19295052	19188501	106571	9893994	39
22	1455075	19275275	19168277	106998	9893571	38
23	1457953	19255517	19148091	107426	9893147	37
24	1460831	19235798	19127943	107855	9892723	36
25	1463708	192161[illegible]8	19107833	108285	9892298	35
26	1466586	19196477	19087761	108716	9891872	34
27	1469463	19176875	19067727	109148	9891445	33
28	1472340	19157313	19047732	109558	9891017	32
29	1475217	19137792	19027777	110015	9890588	31
30	1478094	19118310	19007861	110449	9890159	30

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	1478094	191183 0	19007861	110449	9890159	30
31	1480971	19093865	1898-981	110884	9889729	29
32	1483848	19079459	18968139	111320	9889298	28
33	1486724	19960091	18908334	111757	9888866	27
34	1489601	19040761	18928566	112195	9888433	26
35	1492477	19021469	18908835	112634	9887999	25
36	1495353	19002215	18889141	113074	9887564	24
37	1498229	16982999	18869485	113514	9887128	23
38	1501105	18963822	18849867	113955	9886692	22
39	1503981	18944682	18830285	114397	9886255	21
40	1506857	18925581	18810741	114840	9885817	20
41	1509733	18906517	18791233	115284	9885378	9
42	1512608	18887489	18771760	115729	9884938	8
43	1515484	18868498	18752323	116175	9884498	17
44	1518359	18849543	18732921	116622	9884057	16
45	1521234	18830625	187.3556	117069	9883615	15
46	1524109	18811744	18694227	117517	9883172	14
47	1526984	18792899	18674933	117966	9882728	13
48	1529859	18774090	18655674	118416	9882283	12
49	1532734	18755318	18636451	118867	9881838	11
50	1535608	18736581	1861 262	119319	9881392	10
51	1538482	18717832	18598111	119771	9880495	9
52	1541356	18699218	18578994	120224	9880497	8
53	1544230	18680589	18559911	120678	9880048	7
54	1547104	18661995	18540862	121133	9879598	6
55	1549978	18643437	18521848	121589	9879148	5
56	1552852	18624915	18502869	122046	98 8697	4
57	1555725	18606428	18483924	122504	9878245	3
58	1558597	18587975	18465013	122962	9877792	2
59	1561472	18569557	18446136	123421	9877338	1
60	1564345	18551174	18427293	123881	9876883	0
						mi.

9

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	1564345	18551174	18427293	123881	9876833	60
1	1567218	18532826	18408484	124342	9876427	59
2	1570091	18514511	18389707	124804	9875971	58
3	1572964	18496231	18370964	125267	9875514	57
4	1575837	18477984	18352253	125731	9875056	56
5	1578709	18459772	18333576	126196	9874597	55
6	1581681	18441594	18314933	126661	9874137	54
7	1584453	18423451	18296324	127127	9873677	53
8	1587325	18405341	18277747	127594	9873216	52
9	1590197	18387265	18259203	128062	9872754	51
10	1593069	18369223	18240692	128531	9872291	50
11	1595941	18351214	12222213	129001	9871827	49
12	1598812	18333237	18203765	129472	9871362	48
13	1601684	18315294	18185351	129943	9870897	47
14	1604555	18297384	18166969	130415	9870431	46
15	1607426	18279507	18148619	130888	9869964	45
16	1610297	18261663	18130301	131362	9869496	44
17	1613168	18243851	18112014	131837	9869027	43
18	1616038	18226071	18093758	132313	9868557	42
19	1618909	18208323	18075533	132790	9868087	41
20	1621779	18190606	18057338	133268	9867616	40
21	1624649	18172624	18039177	133747	9867144	39
22	1627519	18155273	18021047	134226	6866671	38
23	1630389	18137655	18002948	134706	9866197	37
24	1633259	18120067	17984880	135187	9865722	36
25	1636129	18102511	17966842	135669	9865246	35
26	1638999	18084987	17948835	136152	9864770	34
27	1641868	18067495	17930859	136636	9864293	33
28	1644738	18050054	17912913	137121	9863815	32
29	1647607	18032604	17894997	137607	9863336	31
30	1650476	18015207	17877114	138093	9862856	30
						mi.

m n	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	1650476	18015207	17877114	138093	9862856	30
31	1653345	17997839	17859259	138580	9862376	29
32	1656214	17980503	17841435	139068	9861895	28
33	1659082	17963198	17823641	139557	9861413	27
34	1661951	17945922	17805875	140047	9860930	26
35	1664819	17928677	17788139	140538	9860446	25
36	1667687	17911463	17770433	141030	9859961	24
37	1670555	17894281	17752759	141522	9859475	23
38	1673423	17877128	17735113	142015	9858989	22
39	1676291	17860006	17717497	142509	9858502	21
40	1679159	17842915	17699911	143004	9858014	20
41	1682027	17825852	17682352	143500	9857525	19
42	1684894	17808820	17664823	143997	9857035	18
43	1687761	17791817	17647322	144495	9856544	17
44	1690628	17774843	17629849	144994	9856053	16
45	1693495	17757899	17612406	145493	9855561	15
46	1696362	17740985	17594992	145993	9855068	14
47	1699229	17724100	17577606	146494	9854574	13
48	1702095	17707244	17560248	146996	9854079	12
49	1704962	17690418	17542919	147499	9853583	11
50	1707828	17673622	17525619	148003	9853087	10
51	1710694	17656856	17508349	148507	9852590	9
52	1713560	17640118	17491106	149012	9852092	8
53	1716426	17623408	17473890	149518	9851593	7
54	1719292	17606726	17456701	150025	9851093	6
55	1722157	17590073	17439540	150533	9850593	5
56	1725022	17573448	17422406	151042	9850092	4
57	1727887	17556851	17405299	151552	9849590	3
58	1730752	17540283	17388220	152063	9849087	2
59	1733617	17523744	17371169	152575	9848583	1
60	1736482	17507234	17354146	153088	9848078	0
						mi. Gr. 80

11

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	1908090	16564818	16379381	185437	9816272	60
1	1910945	16549865	16363862	186003	9815716	59
2	1913800	16534935	16348365	186570	9815160	58
3	1916655	16520028	16332890	187138	9814603	57
4	1919510	16505144	16317438	187706	9814045	56
5	1922365	16490283	16302008	177275	9813486	55
6	1925220	16475445	16286600	188845	9812926	54
7	1928074	16460630	16271214	189416	9812366	53
8	1930928	16445837	16255849	189988	9811850	52
9	1933782	16431067	16240506	190561	9811243	51
10	1936636	16416320	16225185	191135	9810680	50
11	1939490	16401596	16209886	191710	9810116	49
12	1942344	16386895	16194610	192285	9809551	48
13	1945197	16372216	16179355	192861	9808986	47
14	1948050	16357559	16164121	193438	9808420	46
15	1950903	16342924	16148908	194016	9807853	45
16	1953756	16328311	16133716	194595	9807285	44
17	1956609	16313720	16118545	195175	9806816	43
18	1959462	16299151	16103395	195756	9806147	42
19	1962314	16284604	16088266	196338	9805577	41
20	1965166	16270079	16073159	196920	9805006	40
21	1968018	16255576	16058073	197503	9804434	39
22	1970870	16241095	16043008	198087	9803861	38
23	1973722	16226636	16027964	198672	9803287	37
24	1976574	16212198	16012940	199258	9802712	36
25	1979425	16197782	15997937	199845	9820137	35
26	1982276	16183388	15982955	200433	9801561	34
27	1985127	16169016	15967994	201022	9800984	33
28	1987978	16154665	15953053	201612	9800406	32
29	1990829	16140336	15938133	202203	9799827	31
30	1993679	16126028	15923233	202795	9899247	30

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	1993679	16126028	15923233	202795	979924	30
31	1996530	16111742	15908355	203387	9798667	29
32	1999380	16097477	1589:497	203980	9793086	28
33	2002230	16083232	15878·58	204574	9797504	27
34	2005080	16069008	15863839	205169	9·96921	26
35	2007930	16054805	15849040	205765	9796337	25
36	2010780	16040623	15834261	206362	9795753	24
37	2013629	16026462	15819502	206960	9795168	23
38	2016478	16012322	15804764	207558	979458.	22
39	2019327	15998203	15790046	208157	9793995	21
40	2022176	15984105	15775348	208757	9793407	20
41	2025025	15970028	15760670	209358	97928·8	19
42	2027874	15955972	15746012	209969	9792228	18
43	2030722	15941936	15731373	210·63	9791638	17
44	2033570	15927921	15716754	2·1167	979104	16
45	2036418	15913926	15702154	211772	979045·	15
46	2039266	15899951	15687573	212378	9789862	14
47	2042114	15885996	15673012	212984	9789·68	13
48	2044962	15872062	15658461	213591	9788674	12
49	2047809	15858148	15643949	214199	9788079	11
50	2050656	15844254	15629446	214808	9787483	10
51	2053503	15830371	15614953	215418	978 886	9
52	2056350	15816518	15600489	216029	9786288	8
53	2059197	15802685	15586044	216641	9785689	7
54	2062043	15788871	15571617	217254	9785090	6
55	2064889	15775077	15557210	217867	9784490	5
56	2067735	15761303	15542822	218481	9783889	4
57	2070581	15747559	15528463	219096	978:287	3
58	2073427	15733824	15514112	219712	9782684	2
59	2076272	15720109	15499780	220329	9782080	1
60	2079117	15706414	15485467	220947	9781476	0
						mi. Gr.

12 min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	2079117	15706414	15485467	220947	9781476	60
1	2081962	15692738	15471172	221566	9780871	59
2	2084807	15679082	15456896	222186	9780265	58
3	2087652	15665445	15442639	222806	9779658	57
4	2090497	15651828	15428401	223427	9779050	56
5	2093342	15638230	15414181	224049	9778442	55
6	2096180	15624651	15399979	224672	9777833	54
7	2099030	15611092	15385796	225296	9777223	53
8	2101874	15597552	1537163	225921	9776612	52
9	2104718	15584031	15357484	226547	9776000	51
10	2107562	15570530	15343356	227174	9775387	50
11	2110405	15557048	15329246	227802	9774773	49
12	2113248	15543585	15315155	228430	9774159	48
13	2116091	15530141	15301082	229052	9773544	47
14	2118934	15516715	15287026	229689	9772928	46
15	2121777	15503308	15272988	230320	9772311	45
16	2124620	15489920	15258968	230953	9771693	44
17	2127462	15476551	15244966	231585	9771075	43
18	2130304	15463200	15230981	232219	9770456	42
19	2133146	15449868	15217014	232854	9769836	41
20	2135988	15436554	15203064	233490	9769215	40
21	2138830	15423259	15189133	234126	9768593	39
22	2141671	15409982	15175219	234763	9767970	38
23	2144512	15396724	15161323	235401	9767347	37
24	2147353	15383484	15147444	236040	9766723	36
25	2150194	15370262	15133582	236680	9766098	35
26	2153035	15357059	15119738	237321	9765472	34
27	2155876	15343874	15105911	237963	9764845	33
28	2158716	15330708	15092102	238606	9764217	32
29	2161556	15317560	15078310	239250	9763589	31
30	2164396	15304430	15064535	239895	9762960	30

min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	2164396	15304430	15064535	239895	9762960	30
31	2167236	15291319	15050779	240540	9762330	29
32	2170076	15278226	15037040	241186	9761699	28
33	2172916	15265150	15023317	241833	9761067	7
34	2175755	15252092	15009611	242481	9760435	26
35	2178594	15239052	14995922	243130	975980[illegible]	25
36	2181433	15226030	14982250	243780	9759168	24
37	2184272	15213025	14968594	244431	9758533	23
38	2187111	15200038	14954955	245083	9757897	22
39	2189949	15187068	14941333	245735	9757260	21
40	2192787	15174116	14927728	24[illegible]388	9756623	20
41	2195625	15161182	14914140	247042	9755985	19
42	2198463	15148266	14900569	249668	9755346	18
43	2201300	15135367	14887014	248353	9754706	17
44	2204137	15122485	14873475	249010	9754065	16
45	2206974	15109621	14859953	249668	9753423	15
46	2209811	15096774	14846447	250327	9752781	14
47	2212648	15083944	14832957	250987	9752138	13
48	2215485	15071132	14819485	251647	9751494	12
49	2218322	15058337	14806029	252308	9750849	11
50	2221158	15045559	14792589	252970	9750203	10
51	2223994	15032799	14779166	253633	9749557	9
52	2226830	15020056	14765759	254297	9748910	8
53	2229666	15007330	14752368	254962	97482[illegible]2	7
54	2232502	14994620	14738992	255628	9747613	6
55	2235337	14981927	14725632	256295	9746963	5
56	2238172	14969251	14712288	256963	9746312	4
57	2241007	14956592	14698960	257632	9745660	3
58	2243842	14943950	14685649	258301	9745008	2
59	2246677	14931325	14672354	258971	9744355	1
60	2249511	14918717	14659075	259642	9743700	0
						mi.

13 m	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	2249511	14918717	14659075	259642	9743700	60
1	2252345	14906126	14645812	260314	9743045	59
2	2255179	14893551	14632564	260987	9742389	58
3	2258013	14880993	14619332	261661	9741733	57
4	2260847	14868452	14606116	262336	9741076	56
5	2263680	14855927	14592916	263011	9740418	55
6	2266513	14843419	14579732	263687	9739759	54
7	2269346	14830928	14566564	264364	9739099	53
8	2272179	14818453	14553411	265042	9738439	52
9	2275012	14805995	14540274	265721	9737778	51
10	2277844	14793553	14527152	266401	9737116	50
11	2280676	14781128	14514046	267082	9736453	49
12	2283508	14768719	14500955	267764	9735789	48
13	2286340	14756325	14487878	268447	9735124	47
14	2289172	14743947	14474817	269130	9734459	46
15	2292004	14741585	14461771	269814	9733793	45
16	2294835	14719239	14448740	270499	9733126	44
17	2297666	14706909	14435724	271185	9732458	43
18	2300497	14694595	4422723	271872	9731789	42
19	2303328	14682297	14409737	272560	9731120	41
20	2406159	14670015	14396766	273249	9730450	40
21	2308942	14657749	14383810	273939	5729779	39
22	2311819	14645498	14370868	274630	9729107	38
23	2314649	14633263	14357941	275322	9728434	37
24	2317479	14621044	14345029	276015	9727460	36
25	2320309	14608841	14332132	276709	9727085	35
26	2323138	14596654	14319250	277404	9726409	34
27	2325967	14584483	14306384	278099	9725733	33
28	2328799	14572328	14293533	278795	9725056	32
29	2331625	14560189	14280697	279492	9724378	31
30	2334454	14548066	14267876	280190	9723699	30

13 † | —

mi.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	2334454	14548066	14267876	280190	9723699	30
31	2337282	14535958	14255069	280889	9723020	29
32	2340110	14523866	14242277	281589	9722340	28
33	2342938	14511789	14229500	282289	9 21659	27
34	2345766	14499727	14216737	282990	9720977	26
35	2348594	14487680	14203988	283692	9720294	25
36	2351421	14475648	14191253	384395	9719610	24
37	2354248	14463632	14178533	285099	9718926	23
38	2357075	14451631	14165827	285804	9718241	22
39	2359902	14439645	14153135	286510	9717555	21
40	2362729	14427674	14140457	287217	9716868	20
41	2365555	14415718	14127793	287925	9716180	19
42	2368381	14403777	14115143	288634	9715491	18
43	2371207	14391851	14102507	289344	9714802	17
44	2374033	14379941	14089887	290054	9714112	16
45	2376859	14368046	14077281	290765	9713421	15
46	2379684	14356166	14064689	291477	9712729	14
47	2382509	14344301	14452111	292190	9712036	13
48	2385334	14332451	14039547	292904	9711343	12
49	2388159	14320616	14026997	293619	9710649	11
50	2390983	14308796	14014461	294335	9709954	10
51	2393808	14296991	14001939	295052	9709258	9
52	2396632	14285200	13989430	295770	9708561	8
53	2399456	14273424	13976935	296489	9707863	7
54	2402280	14261662	13964453	297209	9707165	6
55	2405104	14249915	13951986	297929	9706466	5
56	2407927	14238182	13939532	298650	9705766	4
57	2410750	14226464	13927092	299372	9705065	3
58	2413573	14214761	13914666	300095	9704363	2
59	2416396	14203072	13902253	300819	9703660	1
60	2419219	14191398	13889854	301544	9702957	0
						mi.

Gr. 14

† —

14 min	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	2419219	14191398	13889854	301544	9702957	60
1	2422041	14179[illegible]38	13877468	302270	9702253	59
2	2423863	14168092	13865095	302997	9701548	58
3	2427685	14156461	13852737	303724	9700842	57
4	2430507	14144844	13840392	304452	9700135	56
5	2433329	14133242	13828061	305181	9699428	57
6	2436150	14121654	13815743	305911	9698720	54
7	2438971	14110081	13863439	306642	9698011	53
8	2441792	14098522	13791148	307374	9697301	52
9	2444613	14086977	13778870	308107	9696590	51
10	2447434	14075447	13766606	308841	9695879	50
11	2450254	14063931	13754355	309576	9695167	49
12	2453074	14052429	13742117	310312	9694454	48
13	2455894	14040940	13729891	311049	9693740	47
14	2458714	14029465	13717679	311786	9693025	46
15	2461533	14018004	13705480	312524	9692309	45
16	2464352	14006557	13693294	313263	9691593	44
17	2467171	13995124	13681121	314003	9690876	43
18	2469990	13983705	13668961	314744	9690158	42
19	2472809	13972300	13656814	315486	9689439	41
20	2475628	13960909	13644680	316229	9688719	40
21	2478446	13949532	13632559	316973	9687998	39
22	2481264	13938168	13620450	317718	9687277	38
23	2484082	13926828	13608354	318464	9686555	37
24	2486900	13915482	13596272	319210	9685832	36
25	2489717	13904159	13584202	319957	9685108	35
26	2492534	13892850	13572145	320705	9684[illegible]83	34
27	2495351	13881554	13560100	321454	9683657	33
28	2498168	13870272	13548068	322204	9682931	32
29	2500984	13859004	13536049	322955	9682204	31
30	2503800	13847749	13524042	323707	9681476	30

14 †

min	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	2503800	13847749	13524042	323707	9681476	30
31	2506626	13836508	13512048	324460	9680747	29
32	2509431	13825280	13500066	325214	9680017	28
33	2512248	13814066	13488097	325969	9679287	27
34	2515064	13802865	13476141	326724	9678556	26
35	2517879	13791678	13464198	327480	9677824	25
36	2520694	13780504	1[illegible]452267	32823[illegible]	9677091	24
37	2523509	1[illegible]769343	13440348	328995	9676357	23
38	252[illegible]324	13758195	13428411	329[illegible]54	9675623	22
39	2529[illegible]38	13747061	13416547	330514	9674888	21
40	2531952	17335940	13404665	331275	9674152	20
41	2524766	13724833	13392796	332037	9673415	19
42	2537680	13713739	13380939	332800	9672677	18
43	2540391	13702658	13369094	333564	9671938	17
44	254[illegible]206	13[illegible]9159[illegible]	13[illegible]57262	3343[illegible]8	9671199	16
45	2546019	13680535	13345442	335093	9670459	15
46	2548832	13669493	1333[illegible]634	335859	9669718	14
47	25[illegible]1645	13658464	13321838	336626	9668976	13
48	2554458	13647448	13310054	337394	9668233	12
49	2557270	13636445	13298282	338163	9667490	11
50	2560082	13625454	13286521	338933	9666746	10
51	2562894	13614476	13274772	339704	9666001	9
52	2565706	13603511	13263035	340476	9665255	8
53	2568517	13592559	13251[illegible]10	341249	9664508	7
54	2571328	13581620	13239597	342023	9663761	6
55	2574139	13570694	13227896	342798	9663013	5
56	2576950	13559761	13216208	343573	9662264	4
57	2579760	13548880	13204531	344349	9661514	3
58	2582570	13537992	13192866	345126	9660763	2
59	2585380	13527117	13181213	345904	9660011	1
60	2588190	13516255	13165572	346683	9659258	0
						mi.

13

min	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
0	2588190	13516255	13165572	346683	9659268	60
1	2591000	13505406	13157943	347463	9658505	59
2	2593809	13494570	13146326	348244	9657751	58
3	2596618	13483746	13134720	349026	9656996	57
4	2599427	13472934	13123126	349808	9656240	56
5	2603236	13462135	13111544	350591	9655484	55
6	2605045	13451348	13099973	351375	9654727	54
7	2607853	13440573	13088413	352160	9653969	53
8	2610661	13429810	130 6864	352946	9653210	52
9	2613469	13419060	13065327	353733	9652450	51
10	2616277	13408322	13053801	354521	9651689	50
11	2619084	13397596	13042286	355310	9650927	49
12	2621891	13386183	13030783	356100	9950165	48
13	2624698	13376182	13019291	356891	9649402	47
14	2627505	13365493	13007810	357683	9648628	46
15	2630312	13354817	12996341	358476	9647873	45
16	2633118	13344153	12984883	359270	9647103	44
17	2635924	13333502	12973438	360064	7646342	43
18	2638730	13322863	12962004	360859	9645575	42
19	2641336	13312237	12950582	361655	9644807	41
20	2644342	13301623	12939171	362452	9644038	40
21	2647147	13291022	12927772	363250	9643268	39
22	2649952	13280432	12916383	364049	9642498	38
23	2652757	13269854	12905005	364849	9641727	37
24	2655562	13259288	12893638	365650	9640915	36
25	2658366	13248734	12882282	366452	9640182	35
26	2661170	13238191	12870916	367255	9639408	34
27	2663974	13227660	12859601	368059	9638633	33
28	2666777	13217141	12848278	368863	9637858	32
29	2669580	13206633	12836965	369668	9637082	31
30	2672383	13196137	12825665	370474	9636305	30

15

mi.	Sinus	Logarithmi	Differentie	Logarithmi	Sinus	
30	2672383	13196137	12825662	370474	9636305	30
31	2675186	13185653	12814372	371281	9635527	29
32	2677989	13175181	12803092	372089	9634748	28
33	2680792	13164721	12791823	372898	9633969	27
34	2683595	13154273	12780565	373708	9633189	26
35	2686397	13143837	12769318	374516	9632408	25
36	2689199	13133413	12758082	375331	9931626	24
37	2692001	13123000	12746856	376144	9630843	23
38	2694802	13112599	12735641	376958	9630059	22
39	2697603	13102210	12724438	379772	9629275	21
40	2700404	13091833	12713246	378587	9628490	20
41	2803205	13081468	12702065	379403	9627794	19
42	2706005	13071114	12690894	380220	9626417	18
43	2708805	13060771	12679733	381038	9626129	17
44	2711605	13050440	12668583	381857	9625341	16
45	2714405	13040120	12657443	382677	9624552	15
46	2717204	13029812	12646314	383498	9623762	14
47	2720003	13019515	12635195	384320	9622971	13
48	2722802	13009229	12624086	385143	9622179	12
49	2725601	12998955	12612988	385967	9621387	11
50	2728400	12988692	12601901	386791	9620594	10
51	2731198	12978441	12590825	387616	9619800	9
52	2733996	12968291	12579759	388442	9619005	8
53	2736794	12957972	12568793	389269	9618209	7
54	2739592	12947755	12557658	390097	9617413	6
55	2742389	12637549	12546623	390926	9616616	5
56	2745186	12927354	12535598	391756	9615818	4
57	2747983	12917171	12524584	392587	9615019	3
58	2750789	12906999	12513580	393419	9614219	2
59	2753577	12896838	12502586	394252	9613418	1
60	2756373	12886689	12491603	395086	9612617	0
						mi

16

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	2756373	12886689	12491603	395086	9612617	60
1	2759169	12876551	12480630	395921	9611815	59
2	2761965	12866423	12469667	396756	9611012	58
3	2764761	12856306	12458714	397592	9619208	57
4	2767556	12846200	12447771	398429	9609403	56
5	2770351	12836105	12436838	399267	9608598	55
6	2773146	12826021	12425915	400106	9607792	54
7	2775941	12815948	12415002	400946	9606985	53
8	2778735	12805886	12404099	401787	9606177	52
9	2781529	12795835	12393206	402629	9605368	51
10	2784323	12785795	12382323	403472	9604559	56
11	2787117	12775766	12371450	404316	9603749	49
12	2789911	12765748	12360587	405161	9602938	48
13	2792704	12755741	12349734	406007	9602126	47
14	2795497	12745745	12338891	406884	9601313	46
15	2798290	12735760	12328059	407701	9608499	45
16	2801082	12725785	12317236	498549	9599685	44
17	2803874	12715821	12306423	409398	9598870	43
18	2806666	12705868	12295620	410248	9598054	42
19	2809458	12695926	12284827	411099	9597237	41
20	2812250	12685995	12274044	411951	9596419	40
21	2815041	12676075	12263271	412804	9595600	39
22	2817832	12666166	12252508	413658	9594781	38
73	2820623	12656267	12241754	414513	9593961	37
24	2823414	12646379	12231010	415369	9593140	36
25	2826244	12636501	12220275	416226	9592318	35
26	2828994	12626633	12209550	417083	9591495	34
27	2831784	12616776	12197835	417941	9590672	33
28	2834574	12606029	12188129	418800	9589848	32
29	2837364	12597093	12177433	419660	9589023	31
30	2040153	12587267	12166746	420521	9588197	30

16

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	2840153	12587267	12166746	420521	9588197	30
31	2842942	12577452	12156069	421383	9587371	29
32	2845731	12567647	12145401	422246	9586544	28
33	2848520	12557853	12134743	423110	9585716	27
34	2851308	12548069	12124094	423975	9584887	26
35	2854096	12538296	12113455	424841	9584057	25
36	2856884	12528533	12102825	425708	9583226	24
37	2859672	12518780	12092204	426576	9582395	23
38	2862459	12509038	12081593	427445	9581563	22
39	2865246	12499306	12070992	428314	9580730	21
40	2868033	12489585	12060401	429184	9579896	20
41	2870819	12479874	12049819	430055	9579061	19
42	2873605	12470174	12039247	430927	9578225	18
43	2876391	12460484	12028684	431800	9577389	17
44	2879177	12450804	12018130	432674	9576552	16
45	2881963	12441134	12007585	423549	9575714	15
46	2884748	12431474	11997949	434425	9574875	14
47	2887533	12421824	11986522	435302	9574036	13
48	2890318	12412184	11976004	436180	9573196	12
49	2893103	12492554	11965495	437059	9572455	11
50	2895888	12392934	11954996	437938	9571513	10
51	2898672	12383324	11944506	438818	9570670	9
52	2901456	12373724	11934025	439699	9569826	8
53	2904240	12364134	11923553	440581	9568982	7
54	2607023	12354554	11913090	441464	9568137	6
55	2909806	12344984	11902536	442348	9567291	5
56	2912589	12335425	11892192	443233	9566444	4
57	2915371	12325876	11881757	444119	9565596	3
58	2918153	12316337	11871330	445007	9564747	2
59	2920935	12306808	11860912	445896	9563898	1
60	2923717	12297289	11850503	446786	9563048	0

17 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	2923717	12297289	11850503	446786	9563048	60
1	2926499	12287780	11840104	447676	9562197	59
2	2929280	12278280	11829713	448567	9561345	58
3	2932061	12268790	11819331	449459	9560492	57
4	2934842	12259310	11808958	450352	9559639	56
5	2937623	12249840	11798594	451246	9558785	55
6	2940403	12240379	11788239	452140	9557930	54
7	2943183	12230928	11777893	453035	9557074	53
8	2945953	12221487	11767556	453931	9556217	52
9	2948743	12212056	11757228	454828	9555360	51
10	2951523	12202634	11746908	455726	9554502	50
11	2954302	12193222	11736597	456625	9553643	49
12	2957081	12183820	11726295	457525	9552783	48
13	2959860	12274427	11716001	458426	9551922	47
14	2962630	12165044	11705716	459328	9551061	46
15	2965416	12155671	11695440	460231	9550199	45
16	2968194	12146308	11685173	461135	9549336	44
17	29 7672	12136954	11674914	462040	9548472	43
18	2973750	12127610	11664695	462945	9547607	42
19	2976527	12118276	11654425	463851	9546742	41
20	2979304	12108952	11644194	464758	9545876	40
21	2982081	12099637	11633971	465666	9545009	39
22	2984857	12090332	11623757	466575	9544141	38
23	2987633	12081036	11613551	467485	9543272	37
24	2990409	12971749	11603353	468396	9542403	36
25	2993185	12062472	11593164	469308	9541533	35
26	2995960	12053204	11582983	470221	9540662	34
27	2998735	12043945	11572810	471135	9539790	33
28	3001510	12034696	11562646	472050	9538917	23
29	3004284	12025456	11552490	472966	953004[illegible]	[illegible]
30	3007058	12016225	11542341	473884	9537169	30

17

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	3008058	12016225	11542341	473884	9537169	30
31	3009832	12007004	11532202	474802	9536294	29
32	3012606	11997792	11522071	475721	9535418	28
33	3015380	11988589	11511948	476641	9534541	27
34	3018153	11979396	11501835	477561	9533664	26
35	3020926	11970212	11491730	478482	9532786	25
36	3023699	11961037	11481633	479404	9531907	24
37	3026472	11951872	11471545	480327	9531027	23
38	3029244	11942716	11461465	481251	9530146	22
39	3032016	11933569	11451393	482176	9529264	21
40	3034788	11924431	21441329	483102	9528382	20
41	3037559	11915303	11431274	484029	9527499	19
42	3040339	11906184	11421227	484957	9526615	18
43	3043101	11897074	11411188	485886	9525730	17
44	3045872	11887973	11401157	486816	9524844	16
45	3048643	21878881	11391134	487747	9523958	15
46	3051413	11869798	11381119	488679	9523071	14
47	3054183	11860724	11371113	489611	9522183	13
48	3056953	11851659	11361115	490544	9521294	12
49	3059723	11842603	11351125	491478	9520404	11
50	3062492	11833557	11341144	492413	9519514	10
51	3065261	11824520	11331171	493349	9518623	9
52	3068030	11815492	11321206	494286	9517731	8
53	3070798	11806473	11311249	495224	9516838	7
54	3073566	11797463	11301300	496163	9515944	6
55	3076334	11788461	11292358	497103	9515050	5
56	3079102	11779468	11281424	498044	9514155	4
57	3081869	11770484	11271498	488986	9513259	3
58	3084636	11761509	11261580	499929	9512362	2
59	3087403	11752543	11251670	590873	9511464	1
60	3090170	11743586	11241768	50[illegible]818	9510565	0
						mi.
						Gr.
						72.

18

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	3090170	11743586	11241768	501818	9510565	60
1	3092936	11734638	11231874	502764	9509666	59
2	3095702	11725699	11221988	503711	9508766	58
3	3098468	11716768	11212109	504659	9507865	57
4	3101234	11707846	11202239	505607	9506963	56
5	3103999	11698933	11192377	596556	9506061	55
6	3106764	11690029	11182523	507506	9505158	54
7	3199529	11681133	11172676	508457	9504254	53
8	3112294	11672246	11162837	509409	9503349	52
9	3115058	11663368	11153006	510362	9502443	51
10	3117822	11654499	11143184	511316	9501536	50
11	3180586	11645638	11133367	512271	9500629	49
12	3123349	11636786	11123559	513227	9499721	48
13	3126112	11627943	11113759	514184	9498812	47
14	3128875	11619199	11103967	515142	9497902	46
15	3131639	11610283	11094182	516101	9496991	45
16	3134400	11601466	11084405	517061	9496080	44
17	3137162	11592658	11074637	518021	9495168	43
18	3139924	11583858	11064876	518982	9494255	42
19	3142686	11575067	11055123	519944	9493341	41
20	3145448	11566285	11045378	520907	9492427	40
21	3148209	11557511	11035640	521871	9491512	39
22	3150970	11548746	11025910	522836	9490596	38
23	3153731	11539989	11016178	523802	9489679	37
24	3156491	11531240	11006471	524769	9488761	36
25	3159251	11522500	10996763	525737	9487842	35
26	3162011	11513768	10987062	526706	9486923	34
27	3164770	11595045	10977369	527676	9486003	33
28	3167529	11496330	10967683	528647	9485082	32
29	3170288	11487624	10958004	529620	9484160	31
30	3173047	11478926	10948332	530594	9483237	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	3173047	11478926	10948352	530594	9483237	30
31	3175805	11470237	10938669	531568	9482314	29
32	3178563	11461556	10929013	532543	9481390	28
33	3181321	11452883	10919364	533519	9480465	27
34	3184079	11444219	10909723	534496	9479539	26
35	3186837	11435563	10900090	535473	9478612	25
36	3189594	11426915	10890464	536451	9477685	24
37	3192351	11418275	10880845	537430	9476757	23
38	3195108	11409644	10871234	538410	9475828	22
39	3197864	11401021	10861630	539391	9474898	21
40	3200620	11392406	10852033	540373	9473967	20
41	3203374	11383800	10842444	541356	9473035	19
42	3206130	11375202	10832862	542340	9472103	18
43	3208885	11366612	10823287	543325	9471170	17
44	3211640	11358030	10813819	544311	9470236	16
45	3214395	11349456	10804158	545298	9469301	15
46	3217150	11340891	10795605	546286	9468366	14
47	3219904	11332334	10785059	547275	9467430	13
48	3222658	11323785	10775520	548265	9466493	12
49	3225412	11315244	10765988	549256	9465555	11
50	3228165	11306711	10756462	550249	9464616	10
51	3230918	11298186	10746944	551242	9463677	9
52	3233671	11289670	10737434	552236	9462737	8
53	3236423	11281162	10727931	553231	9461796	7
54	3239175	11272662	10718436	554226	9460854	6
55	3241927	11264170	10708948	555222	9459911	5
56	3244679	11255686	10699467	556219	9458968	4
57	3247430	11247210	10689993	557217	9452024	3
58	3250181	11238742	10680526	558216	9457079	2
59	3252932	11230282	10671066	556216	9456133	1
60	3255682	11221830	10661623	560217	9465186	0
						mi.

19 mi.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
0	3255682	11221830	10661613	560217	9455186	60
1	3258432	11213386	10652167	561219	9454239	59
2	3261182	11204950	10642728	562222	9453291	58
3	3263931	11196522	10633296	563226	9452342	57
4	3266681	11188102	10623871	564231	9451392	56
5	3269439	12179690	10614453	565237	9450441	55
6	3272179	11171286	10605042	566244	9449490	54
7	3274927	11162889	10595637	567252	9448538	53
8	3277675	11154500	10586239	568291	9447585	52
9	3280423	11146119	10576849	569270	9446631	51
10	3283171	11137746	14567466	570280	9445676	50
11	3285918	11129381	10558090	571291	9444720	49
12	3288665	11121024	10548721	572303	9443764	48
13	3291412	11112675	10539359	573316	9442807	47
14	3294159	11104334	10530004	574330	9441849	46
15	3296906	11096000	10520655	575345	9440890	45
16	3299652	11087674	10511313	576361	9439931	44
17	3302398	11079356	10501997	577370	9438971	43
18	3305144	11071046	10492648	578398	9438010	42
19	3307889	11062744	10483326	579418	9437048	41
20	3310634	11054449	10474010	580439	9456085	40
21	3313379	11046162	10464702	581460	9435122	39
22	3316123	11037883	10455401	582482	9434158	38
23	3318867	11029612	10446107	583505	9433193	37
24	3321611	11021348	10436819	584529	9432227	36
25	3324355	11013092	10427538	585554	9431260	35
26	3327098	11004843	10518263	586580	9430293	34
27	3329841	10996602	10408995	587607	9429325	33
28	3332585	10988368	10399733	588635	9428356	32
29	3335327	10980142	10390479	589663	9437386	31
30	3338069	10971923	10381231	590692	9426415	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	3338069	10971923	10381231	590692	9426415	30
31	3340811	10963712	10371990	591722	9425444	29
32	3343553	10955509	10362756	592753	9424472	28
33	3346294	10947313	10353528	593785	9423499	27
34	3349035	10939125	10344307	594818	9422525	26
35	3351776	10930944	10335092	595852	9421550	25
36	3354516	10922771	10325884	596887	9420575	24
37	3357256	10914606	10316682	597924	9419599	23
38	3359996	10906448	10307486	598962	9418622	22
39	3362736	10898298	10298297	600001	9417644	21
40	3365475	10890156	10289115	601041	9416665	20
41	3368214	10882021	10279940	602081	9415685	19
42	3370953	10873894	10270772	603122	9414705	18
43	3373691	10865774	10261610	604164	9413724	17
44	3376429	10857661	10252454	605207	9412742	16
45	3379167	10849555	10243304	606251	9411760	15
46	3381905	10841457	10234161	607296	9410777	14
47	3384642	10833366	10225024	608342	9409793	13
48	3387379	10825282	10215893	609389	9408808	12
49	3390116	10817206	10206770	610436	9407822	11
50	3392852	10809137	.0197653	611484	9406836	10
51	3395588	10801075	10188542	612533	9405849	9
52	3398324	10793021	10179438	613583	9404861	8
53	3401060	10784974	10170340	614634	9403872	7
54	3403795	10776934	10161248	615686	9402882	6
55	3406530	10768902	10152162	616740	9401891	5
56	3409265	10760877	10143082	617795	9400900	4
57	3411999	10752860	10134009	618851	9399908	3
58	3414733	10744850	10124942	619908	9398915	2
59	3417467	10736847	10115881	620966	9397921	1
60	3420201	10728852	10106827	622025	9396926	0
						mi.

20 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	3420201	10728852	10106827	622025	9396926	60
1	3422934	10720865	10097781	623084	9395931	59
2	3425667	10712885	10088741	624144	9394935	58
3	3428400	10704912	10079707	625205	9393938	57
4	3431133	10696945	10070678	626267	9392940	56
5	3433865	10688984	10061654	627330	9391941	55
6	3436597	10681030	10052636	628394	9390942	54
7	3439329	10673085	10043616	629459	6389942	53
8	3442060	10665147	10034822	630525	9388941	52
9	3444791	10657216	10025624	631592	9387939	51
10	3447522	10649292	10016632	632660	9386937	50
11	3450253	10641375	10007646	633729	9385934	49
12	3452983	10633465	9998666	634799	9384930	48
13	3455713	10625562	9989692	635870	9383925	47
14	3458442	10617667	9980725	636942	9382919	46
15	3461171	10609779	9971764	638015	9381913	45
16	3463900	10601898	9962810	639088	9380906	44
17	3466629	10594024	9953862	640162	9379898	43
18	3469357	10586157	9944920	641237	9378889	42
19	3472085	10578297	9935984	642313	9377880	41
20	3474813	10570444	9927054	643390	9376870	40
21	3477540	10562598	9918130	644468	9375859	39
22	3480267	10554760	9909213	645547	9374847	38
23	3482994	10546929	9900302	646627	9373834	37
24	3485721	10539104	9891396	647708	9372820	36
25	3488447	10531286	9882496	648790	9371806	35
26	3491173	10523474	9873601	649873	9370791	34
27	3493899	10515669	9864711	650958	9369775	33
28	3496624	10507871	9855827	652044	9368758	32
29	3499343	10500080	9846949	653131	9367740	31
30	3502075	10492295	9838076	654219	9366722	30

m.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	3502075	10492295	9838076	654219	9366722	30
31	3504799	10484516	9829209	655307	9365703	29
32	3507523	10476745	9820349	656396	9364683	28
33	3510247	10468981	9811495	657486	9363662	27
34	3512971	10461225	9802648	658577	9362640	26
35	3515694	10453476	9793807	659669	9361618	25
36	3518417	10445734	9784972	660762	9360595	24
37	3521140	10437999	9776143	661856	9359571	23
38	3523862	10430271	9767320	662951	9358546	22
39	3526584	10422551	9758503	664047	9357521	21
40	3529306	10414836	9749693	665143	9356495	20
41	3532027	10407129	9740889	666240	9355468	19
42	3534748	10399429	9732091	667338	9354440	18
43	3537469	10391735	9723298	668437	9353411	17
44	3540190	10384047	9714510	669537	9352382	16
45	3542910	10376366	9705728	670638	9351352	15
46	3545630	10368692	9696951	671741	9350321	14
47	3548350	10361024	9688179	672845	9349289	13
48	3551070	10353362	9679412	673950	9348257	12
49	3553789	10345707	9670650	675056	9347224	11
50	3556503	10338057	9661894	676163	9346192	10
51	3559227	10330415	9653144	677271	9345151	9
52	3561945	10322780	9644400	678380	9344119	8
53	3564663	10315152	9635662	679490	9343082	7
54	3567380	10307531	9626930	680601	9342045	6
55	3570097	10299916	9618204	681712	9341007	5
56	3572814	10292308	6609484	682824	9339963	4
57	3575531	10284707	9600770	683937	9338928	3
58	3578247	10277113	9592062	685051	9337887	2
59	3580963	10269526	9583360	686166	9336846	1
60	3583679	10261946	9574664	687282	9335804	0

21 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	3583679	10261946	9574664	687282	9335804	60
1	3586395	10254372	6565973	688399	9334761	59
2	3589110	10246804	9557287	689517	9333717	58
3	3591825	10239243	9548607	690636	9332673	57
4	3594540	10231658	9539932	691756	9331628	56
5	3597254	10224140	9531263	692877	9330582	55
6	3599968	10216598	9522599	693999	9329535	54
7	3602682	10209063	9513941	695122	9328488	53
8	3605395	10201534	9505288	696246	9227440	52
9	3608108	10194012	9496642	697370	9326391	51
10	3610821	10186496	9488001	698495	9325341	50
11	3613533	10178987	9479366	699621	9324290	49
12	3616245	10171484	9470736	700748	9323238	48
13	3618957	10163988	9462111	701877	9322186	47
14	3621669	10156498	9453491	703007	9321133	46
15	3624380	10149015	9444877	704138	9320079	45
16	3627091	10141538	9436268	705270	9319024	44
17	3629802	10134067	9427664	706403	9317969	43
18	3632512	10126603	9419066	707537	9316913	42
19	3635222	10119145	9410473	708672	9315856	41
20	3637932	10111694	9401886	709808	9314798	40
21	3640642	10104249	9393305	710944	9313739	39
22	3643351	10096811	9384730	712081	9312680	38
23	3646060	10089379	9376160	713219	9311620	37
24	3648768	10081953	9367595	714358	9310559	36
25	3652478	10074533	9359035	715498	9309497	35
26	3654184	10067120	9350481	716639	9308434	34
27	3656892	10059713	9341931	717782	9307371	33
28	3659599	10052312	9333386	718926	9306307	32
29	3662306	10044918	9324847	720071	9305242	31
30	3665512	10037530	9316313	721217	9304176	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	3665012	10037530	9316313	721217	9304176	30
31	3667718	10030148	9307784	722364	9303109	29
32	3670424	10022773	9299261	723512	9302042	28
33	3673130	10015404	9290744	724660	9300974	27
34	3675835	10008041	9282232	725809	9299905	26
35	3678541	10000685	9273726	726959	9298836	25
36	3681246	9993335	9265215	728110	9297766	24
37	3683951	9985991	9256729	729262	9296695	23
38	3686655	9978653	9248238	730415	9295623	22
39	3689359	9971322	6239753	731569	9294550	21
40	3692062	9963997	9231273	732724	9293476	20
41	3694765	9956678	9222798	733880	9292401	19
42	3697468	9949366	9214326	735037	9291326	18
43	3700170	9942060	9205865	736195	9290250	17
44	3702872	9934760	9197406	737354	9289173	16
45	3705574	9927466	9188952	738514	9288096	15
46	3708276	9920178	9180503	739675	9287018	14
47	3710977	9912896	9172059	740837	9285939	13
48	3713678	9905620	9163620	742000	9284859	12
49	3716379	6898350	9155186	743164	9283778	11
50	3719080	9891086	9146757	744329	9282697	10
51	3721780	9883828	9138333	745495	9281615	9
52	3724480	9876577	9129915	746662	9280532	8
53	3727179	9869332	9121502	747830	9279448	7
54	3729878	9862093	9113094	748999	9278363	6
55	3732577	9854860	9104691	750169	9177278	5
56	3735275	9847633	9096293	751340	9276192	4
57	3737973	9840412	9087900	752512	9275105	3
58	3740671	9833192	9079512	753685	9274017	2
59	3743369	9825988	9671129	754859	9272928	1
60	3746066	9818785	9062752	756033	9271829	0
						mi.

22 mi.	Sinus	Logarithmi	+ Differentia	— Logarithmi	Sinus	
0	3746066	9818785	9062752	756033	9271839	60
1	3748763	9811589	9054381	757208	9270749	59
2	3751460	9804399	9046015	758384	9269658	58
3	3754156	9797215	9037654	759561	9268566	57
4	3756852	9790036	9029296	760740	9267474	56
5	3759548	9782863	9020943	761920	9266381	55
6	3762243	9775696	9012595	763101	9265287	54
7	3764938	9768535	9004252	764283	9264192	53
8	3767633	9761380	8995914	765466	9263096	52
9	3770327	9754231	8987581	766650	9262000	51
10	3773021	9747088	8979253	767835	9260903	50
11	3775715	9739950	8970929	769021	9259805	49
12	3778408	9732818	8962610	770208	9258706	48
13	3781101	9725693	8954297	771396	9257606	47
14	3783794	9718574	8945989	772585	9256506	46
15	3786486	9711461	8937686	773775	9255405	45
16	3789178	9704354	8929388	774966	9254303	44
17	3791870	9697353	8921196	776157	9253200	43
18	3794562	9690158	8912809	777349	9252097	42
19	3797253	1683069	8904527	778542	9250993	41
20	3799944	9675986	8896259	779736	9249888	40
21	3802635	9668908	8887977	780931	9248782	39
22	3805325	9661836	8879709	782127	9247676	38
23	3808015	9654770	8871446	783324	9246569	37
24	3810704	9647709	8863187	784522	9245461	36
25	3813393	9640654	8854933	785721	9244352	35
26	3816082	9633605	8846683	786922	9243242	34
27	3818771	9626562	8838438	788124	9242131	33
28	3821459	5619525	8830198	789327	9241020	32
29	3824147	9612494	8821963	790531	9239908	31
30	3826834	9605468	8813732	791736	9238795	30

22

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	3826834	9605468	8813732	791736	9238795	30
31	3829521	9598448	8805506	792942	9237682	29
32	3832208	9591434	8797285	794149	9236568	28
33	3834895	9584426	8789069	795357	9235453	27
34	3837581	9577424	8780859	796565	9234337	26
35	3840267	9570427	8772653	797774	9233220	25
36	3842953	9563436	8764452	798984	9232103	24
37	3845638	6556451	8756256	800195	9230985	23
38	3848323	9549472	8748065	801407	9229866	22
39	3851008	9542498	8739878	802620	9228746	21
40	3853692	9535530	8731696	803834	9227625	20
41	3856376	9528567	8723518	805049	9226504	19
42	3859060	9521610	8715345	806265	9225382	18
43	3861743	9514659	8707177	807482	9224259	17
44	3864426	9507713	8699013	808700	9223135	16
45	3867109	9500773	8690854	809919	9222010	15
46	3869791	9493839	8682700	811139	9220884	14
47	3872473	9486911	8674551	812360	9219758	13
48	3875155	9479988	8666405	813583	9218631	12
49	3877837	9473071	8658264	814807	9217504	11
50	3880518	9466160	8650128	816032	9216376	10
51	3883199	9459254	8641996	817258	9215247	9
52	3885880	9452354	8633870	818484	9214117	8
53	3888560	9445460	8625749	819711	9219286	7
54	3891240	9438571	8617632	820939	9211855	6
55	3893919	9431688	8609520	822168	9210723	5
56	3896598	9424810	8601412	823398	9209590	4
57	3899277	9417938	8593309	824629	9208457	3
58	3901955	9411071	8585210	825861	9207323	2
59	3904633	9404210	8577116	827094	9206185	1
60	3907311	9397354	8569026	828328	9205049	0
						mi. Gr.

23

m.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	3907311	9397354	8569016	828318	9205049	60
1	3909989	9390504	8560941	829563	9203912	59
2	3912666	9383660	8552861	830799	9202774	58
3	3915343	9376821	8544785	832036	9201635	57
4	3918020	9369988	8536714	833274	9200496	56
5	3920696	9363160	8528647	834513	9199356	55
6	3923372	9356337	8520584	835753	9198215	54
7	3926048	9349520	8512525	836995	9197073	53
8	3928723	9342708	8504470	838238	9195931	52
9	3931398	9335902	8496420	839482	9194788	51
10	3934072	9329101	8488374	840727	9193644	50
11	3936746	9322306	8480333	841973	9192499	49
12	3939420	9315516	8472296	843220	9191353	48
13	3942093	9308731	8464263	844468	9190207	47
14	3944766	9301952	8456236	845716	9189060	46
15	3947439	9295178	8448213	846965	9187912	45
16	3950112	9288410	8440195	848215	9186763	44
17	3952784	9281647	8432181	849466	9185614	43
18	3955456	9274890	8424172	850718	9184464	42
19	3958128	9268138	8416167	851971	9183313	41
20	3960799	9261392	8408167	853225	9182161	40
21	3963470	9254651	8400171	854480	9181009	39
22	3966140	9247915	8392179	855736	9179856	38
23	3968810	9241185	8384192	856993	9178702	37
24	1971480	9234460	8376209	858251	9177547	36
25	3974149	9227741	8368231	859510	9176391	35
26	3976818	9221027	8360257	860770	9175235	34
27	3976487	9214319	8352288	862031	9174078	33
28	3982155	9207616	8344322	863294	6172920	32
29	3984823	9200918	8339360	864558	9171761	31
30	3987491	9194226	8328403	865823	9170601	30

23 †

m.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	3987491	9194226	8328403	865825	9170601	30
31	3990159	9187539	8320450	867089	9169440	29
32	3992826	9180857	8312501	868356	9168279	28
33	3995493	9174181	8304558	869623	9167117	27
34	3998159	9167510	8296616	870891	9165955	26
35	4000825	9160844	8288684	872160	9164792	25
36	4003491	9154183	8280753	873430	9163628	24
37	4006156	9147528	8272827	874701	9162463	23
38	4008821	9140878	8264905	875973	9161297	22
39	4011486	9134233	8256987	877246	9160131	21
40	4014150	9127593	8249073	878520	9158964	20
41	4016814	9120959	8241164	879795	9157796	19
42	4019478	9114330	8233259	881071	9156627	18
43	4022141	9107706	8225358	882348	9155457	17
44	4024804	9101087	8217461	883626	9154286	16
45	4026467	9094473	8209568	884905	9153115	15
46	4030130	9087865	8201679	886186	9151943	14
47	4032792	9081262	8193794	887468	9150770	13
48	4035454	9074664	8185913	888751	9149597	12
49	4038115	9068071	8178036	890035	9148423	11
50	4040776	9061483	8170163	891320	9147248	10
51	4043437	9054901	8162295	892606	9146072	9
52	4046097	9048324	8154431	893893	9144895	8
53	4048757	9041752	8146571	895181	9143718	7
54	4051416	9035185	8138715	896470	9142540	6
55	4054075	9028623	8130863	897760	9141361	5
56	4056734	9022066	8123015	899051	9140181	4
57	4059392	9015514	8115172	900342	9149001	3
58	4062050	9008968	8107334	901634	9137820	2
59	4064708	9002427	8099500	902927	9136638	1
60	4067366	8995891	8091670	904221	9135455	0
						mi.

Gr. 66

24 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	4067366	8995891	8091670	904221	9135455	60
1	4070023	8989360	8083844	905516	9134271	59
2	4072680	8982834	8076022	906812	9133087	58
3	4075337	8976313	8068204	908109	9131902	57
4	4077993	8969797	8060389	909408	9130716	56
5	4080649	8963286	8052578	910708	9129529	55
6	4083305	8956780	8044771	912009	9128342	54
7	4085960	8950280	8036969	913311	9127154	53
8	4088615	8943785	8029171	914614	9125965	52
9	4091269	8937295	8021377	915918	9124775	51
10	4093923	8930810	8013587	917223	9123584	50
11	4096577	8924330	8005801	918529	9122392	49
12	4099231	8917855	7998019	919836	9121200	48
13	4101884	8611385	7990241	921144	9120007	47
14	4104537	8904920	7982467	922453	9118814	46
15	4107189	8898460	7974697	923763	9117620	45
16	4109841	8892005	7966931	925074	9116425	44
17	4112493	8885555	7959169	926386	9115229	43
18	4115144	8879110	7951411	927699	9114032	42
19	4117795	8872670	7943657	629013	9112835	41
20	4120446	8866235	7935908	930327	9111637	40
21	4123096	8859804	7928161	931643	9110438	39
22	4125746	8853379	7920419	932960	9109238	38
23	4128395	8846959	7912681	934278	9108038	37
24	4131044	8840544	7904947	935597	9106837	36
25	4133693	8834134	7897217	936917	9105635	35
26	4136341	8827729	7889491	938238	9104432	34
27	4138989	8821329	7881769	939560	9103228	33
28	4141637	8814934	7874051	940883	9102024	32
29	4144285	8808544	7866337	942207	9100819	31
30	4146932	8802159	7858627	943532	9099613	30

mi.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	4146932	8802159	7858627	943532	9099613	30
31	4149579	8795779	7850921	944858	9098406	29
32	4152226	8789404	7843219	946185	9097198	28
33	4154872	8783033	7835520	947513	9095990	27
34	4157518	8776667	7827825	948842	9094781	26
35	4160163	8770306	7820134	950172	9093572	25
36	4162808	8763959	7812456	951503	9092362	24
37	4165453	8757599	7804764	952835	9091151	23
38	4168097	8751253	7797085	954168	9089939	22
39	4170741	8744912	7789409	955503	9088726	21
40	4173385	8738575	7781736	956839	9087512	20
41	4176028	8732243	7774067	958176	9086297	19
42	4178671	8725916	7766402	959514	9085082	18
43	4181313	8719594	7758741	960853	9083866	17
44	4183955	8713277	7751084	962193	9082649	16
45	4186597	8706965	7743431	963534	9081432	15
46	4189239	8700657	7735782	964875	9080214	14
47	4191880	8694354	7728137	966217	9078995	13
48	4194521	8688056	7720496	967560	9077775	12
49	4197162	8681763	7712859	968904	9076555	11
50	4199802	8675475	7705226	970249	9075334	10
51	4202442	8669192	7697597	971595	9074112	9
52	4205081	8662913	7689970	972943	9072889	8
53	4207720	8656639	7682347	974292	9071665	7
54	4210359	8650370	767428	975642	9070441	6
55	4212997	8644106	7667113	976993	9069216	5
56	4215635	8637846	7659501	978345	9067990	4
57	4218273	8631591	7651893	979698	9066763	3
58	4220910	8625341	7644289	981052	9065535	2
59	4223547	8619096	7636689	982407	9064307	1
60	4226183	8612856	7629093	983763	9063078	0
						mi.

25 min.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	4226183	8612856	7629093	983763	9063078	60
1	4228819	8606620	7621500	985120	9061848	59
2	4231455	8600389	7613911	986478	9060618	58
3	4234090	8594163	7606326	987837	9059387	57
4	4236725	8587942	7598745	989197	9058155	56
5	4239360	85817[illegible]5	7591167	990558	9056922	55
6	4241994	8575513	7583593	991920	9055688	54
7	4244628	8569306	7576023	993283	9054454	53
8	4247262	8563103	7568456	994647	9053219	52
9	42[illegible]9895	85[illegible]5695	7560893	996012	905[illegible]985	51
10	4252528	8550712	7553333	997379	9050746	50
11	425516[illegible]	8544523	75[illegible]45[illegible]76	998747	9049508	49
12	4257793	8538339	7538223	1000116	9048270	48
13	4260425	85[illegible]2160	7530674	10[illegible]1486	9047031	47
14	4263056	8525985	7523129	1002856	9045791	46
15	4265687	8519815	7515588	1004227	9044551	45
16	4268318	8513650	7508051	1005599	9043310	44
17	4270949	8507489	7500517	1006972	9042068	43
18	4273579	8501333	7492987	1008346	9040825	42
19	4276209	8495181	7485460	1009721	9039582	41
20	[illegible]278838	8489034	7477937	1011097	90383[illegible]8	40
21	4281467	8482892	7470418	1012474	9037093	39
22	4284096	8476754	7462902	1013[illegible]52	9035847	38
23	4286724	8470621	7455389	1015232	9034600	37
24	4269352	8464493	7447880	1016613	90333[illegible]3	36
25	42[illegible]1979	8458369	7440374	1017995	9032105	35
26	4294606	8452250	7432872	1019378	9030856	34
27	4297233	8446135	7425373	1020762	9029606	33
28	4299859	84[illegible]0025	7417878	1022147	9028356	32
29	[illegible]302485	8433919	7420386	1023533	9027105	31
30	43051[illegible]	8427818	7402898	1024920	9025853	30

25 mi.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
			+ | −			
30	4305111	8427818	7402898	1024920	9025853	30
31	4307736	8421722	7395414	1026308	9024600	29
32	4310361	8415630	7387933	1027697	9023347	28
33	4312986	8409543	7380456	1029087	9022093	27
34	4315610	8403460	7372982	1030478	9020838	26
35	4318234	8397382	7365512	10318 0	9019582	25
36	4320858	8391308	7358045	1033263	9018326	24
37	4323481	8385239	7350582	1034657	9017069	23
38	4326104	8379174	7343122	1036052	9015811	22
39	4328726	8373114	7335665	1037449	9014552	21
40	4331348	83 7059	732 212	1038847	9013292	20
41	4333970	8361008	7320762	1040246	9012031	19
42	4336591	8354962	7313316	1041646	9010770	18
43	4339212	8348920	73 5873	1043047	9009508	17
44	4341833	8342883	7298434	1044449	9008245	16
45	4344453	8336850	7290998	1045852	9006982	15
46	4347073	8330822	7283566	1047256	9005718	14
47	4349693	8324798	7276138	1048 60	9004453	13
48	4352312	8318778	7268713	1050065	9003187	12
49	4354931	8312763	7261292	1051471	9001921	11
50	4357549	8306752	7253874	1052878	9000654	10
51	4360167	8300746	7246459	1054287	899938[illegible]	9
52	4362785	9294744	7239047	1055697	8998117	8
53	4365402	8288747	7231639	1057108	8996848	7
54	4368019	8282754	7224234	1058520	8995578	6
55	4370635	8276765	7216832	1059933	8994307	5
56	4373251	8270781	7209434	1061347	8993035	4
57	4375867	8264801	7202039	1062762	8991762	3
58	4378482	8258826	7194648	1064178	8990489	2
59	4381097	8252855	7187260	1065595	89892[illegible]5	1
60	4383712	8246889	7179875	1067014	8987946	0
						64 Gr.

26

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	4383712	8246889	7179875	1067014	8987940	60
1	4386326	8240927	7172493	1068434	8986664	59
2	4388940	8234970	7165115	1069855	8985388	58
3	4391554	8229017	7157740	1071277	8984111	57
4	4394167	8223068	7150368	1072700	8982833	56
5	4396780	8217124	7143001	1074123	8981555	55
6	4399392	8211184	5135637	1075547	8980276	54
7	4402004	8205249	7128277	1076972	8978996	53
8	4404616	8199318	7120920	1078398	8977715	52
9	4407227	8193391	7113566	1079825	8976433	51
10	4409838	8187469	7106216	1081253	8975151	50
11	4412449	8181551	7098868	1082683	8973868	49
12	4415059	8175638	7091524	1084114	8072584	48
13	4417669	8169729	7084183	1085546	8971299	47
14	4420278	8163824	7076845	1086979	8970013	46
15	4422887	8157923	7069510	1088413	8968727	45
16	4425496	8152027	7062179	1089848	8967440	44
17	4428104	8146135	7054851	1091284	8966152	43
18	4430712	8140247	7047526	1092721	8964864	42
19	4433320	8134364	7040205	1094159	8963575	41
20	4435927	8128485	7032887	1095598	8962285	40
21	4438534	8122610	7025572	1097038	8960994	39
22	4441140	8116739	7018260	1098479	8959702	38
23	4443746	8110873	7010952	1099921	8958410	37
24	4446352	8105011	7003647	1101364	8957117	36
25	4448957	8099153	6996345	1102808	8955824	35
26	4451562	8093299	6989045	1104254	8954530	34
27	4454167	8087450	6981749	1105801	8953235	33
28	4456771	8081605	6974456	1107149	8941939	32
29	4459375	8075764	6967166	1108598	8950642	31
30	4461978	8069927	6959879	1110048	8949344	30

26

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	4461978	8069927	6959879	1110048	8949344	30
31	4464581	8064095	6952596	1111499	8948045	29
32	4967184	8058267	6945316	1112951	8946746	28
33	4469786	8052443	6938039	1114404	8945446	27
34	4472388	8046623	6930765	1115858	8944146	26
35	4474990	8040808	6923495	1117313	8942845	25
36	4477591	8034997	6916228	1118769	8941543	24
37	4480192	8029190	6908964	1120226	8940240	23
38	4482792	8023387	6901703	1121684	8938936	22
39	4485392	8017589	6894546	1123143	8937632	21
40	4487992	8011795	6887191	2124604	8936327	20
41	4490591	8006005	6879939	1126066	8935021	19
42	4493190	8000219	6872690	1127529	8933717	18
43	4495788	7994437	6865444	1128993	8932406	17
44	4498386	7988660	6858202	1130458	8931098	16
45	4500984	7982887	6850963	1131924	8929789	15
46	4503582	7977118	6843727	1133391	8928479	14
47	4506179	7971353	6836494	1134859	8927169	13
48	4508776	7965592	6829265	1136327	8925858	12
49	4511372	7959835	6822039	1137796	8924546	11
50	4514968	7954083	6814817	1139266	8923234	10
51	4516563	7948335	6807597	1140738	8921921	9
52	4519158	7942591	6800380	1142211	8920607	8
53	4521753	7936851	6703166	1143685	8919292	7
54	4524347	7931115	6785955	1145160	8917976	6
55	4526941	7925383	6778747	1146636	8916659	5
56	4529535	7919655	6771542	1148113	8915341	4
57	4532128	7913932	6764340	1149592	8914023	3
58	4534721	7908213	6757141	1151072	8912704	2
59	4537313	7902498	6749945	1152553	8911385	1
60	4539905	7896787	6742752	1154035	8910065	0
						mi.

27

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	4539905	7896787	6742752	1154035	8910065	60
1	4542497	7891080	6735562	1155518	8908744	59
2	4545088	7885377	6728475	1157[illegible]0[illegible]	89074[illegible]2	58
3	4547679	7879678	672[illegible]191	11584[illegible]7	8906099	57
4	4540270	7873983	6714010	1159973	89[illegible]4776	56
5	4552860	7868[illegible]92	67068[illegible]2	1161460	8903[illegible]52	55
6	4555450	7862605	6699657	1162948	89[illegible]2127	54
7	4558639	7856923	6692486	1164437	8900802	53
8	4560[illegible]28	7851245	6685[illegible]18	116 927	8899476	52
9	4563216	7845571	6678153	1167418	8898149	51
10	4565804	7839901	6670991	1168910	8896821	50
11	4568392	7834235	6663832	1170403	8895492	49
12	4570979	7828573	6656675	1171897	8894163	48
13	4573566	7822915	6649523	1173392	8892833	47
14	4576153	7817261	6642373	1174888	8891502	46
15	4578729	7811611	6635225	1176386	8890171	45
16	4581325	7805965	6628080	1177885	8888839	44
17	4584911	7800323	6620938	1179385	8887506	43
18	4586496	7794685	6613799	1180886	8886172	42
19	4589081	7789051	6606663	1182388	8884838	41
20	4591665	7783422	6599531	1183891	8883503	40
21	4594249	7777797	6592402	1185395	8882167	39
22	4596833	7772176	6585276	1186900	888[illegible]830	38
23	4599416	7766558	6578152	1188406	8879492	37
24	4601999	7760944	6571031	1189913	8878154	36
25	4604581	7755334	6563913	119[illegible]421	8876815	35
26	4607163	7749728	6556797	1192931	8875485	34
27	4609744	7744126	6549684	1194442	8874134	33
28	4612325	7738528	6542574	1195954	8872793	32
29	4614906	7732934	6197467	1197467	8871451	31
30	4617486	7727344	6528363	1198981	8874108	30

27

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	4617486	7727344	6528363	1198981	8870108	30
31	4620066	7721757	6521261	1200496	8868765	29
32	4622646	7716174	6514162	1202012	8867421	28
33	4625225	7710596	6507067	1203529	8866076	27
34	4527804	7705022	6499975	1205047	8864730	26
35	4630382	6799452	6492886	1206566	8863383	25
36	4632960	7693886	6485800	1208086	8862035	24
37	4635538	7688324	6478717	1209607	8860687	23
38	4638115	7682766	6471637	1211129	8859338	22
39	4640692	7677212	6464560	1212652	8857989	20
40	4643268	7671662	6457485	1214177	8856639	21
41	4645844	7666116	6450413	1215703	8855288	19
42	4648420	7660574	6443344	1217230	8852936	18
43	4650995	7655035	6436277	1218758	8852583	17
44	4653570	7649500	6429213	1220287	8851230	16
45	4656145	7643969	6422152	1221817	8849876	15
46	4658719	7638442	6415094	1223348	8848521	14
47	4661293	7632919	6408039	1224880	8847165	13
48	4663866	7627400	6400987	1226413	8845809	12
49	4666439	7621885	6393938	1227947	8844452	11
50	4669012	7616374	6386893	1229481	8843095	10
51	4671584	7610867	6379850	1231017	8841737	9
52	4674156	7605363	6372809	1232554	8840378	8
53	4676727	7599863	6365771	1234092	8839018	7
54	4679298	7594367	6358735	1235632	8837657	6
55	4681869	7588875	6351702	1237173	8836295	5
56	4684439	7583387	6344672	1238715	8834932	4
57	4687009	7577903	6337645	1240258	8833569	3
58	4689578	7572422	6330620	1241802	8832205	2
59	4692147	7566945	6323598	1243347	8830841	1
60	4694716	7561472	6316578	1233894	8829476	0
						mi.

28 †

mi.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
0	4694716	7561472	6316578	1244894	8829476	60
1	4697284	7556003	6309561	1246442	8828110	59
2	4699852	7550538	6302547	1247991	8826743	58
3	4702419	7645076	6295535	1249541	8825375	57
4	4804986	7539618	6288526	1251092	8824007	56
5	4707553	7534164	6281520	1252644	8822638	55
6	4710119	7528714	6274517	1254197	8821268	54
7	4712685	7523268	6267517	1255751	8819898	53
8	4715250	7517826	6260521	1257305	8818527	52
9	4717815	7512388	6253528	1258860	8817155	51
10	4720380	7506954	6246528	1260416	8815783	50
11	4722944	7501524	6239550	1261974	8814408	49
12	4725508	7496097	6232564	1263533	8813034	48
13	4728071	7490674	6225581	1265093	8811659	47
14	4730634	7485255	6218601	1266654	8810285	46
15	4733197	7479840	6211624	1268216	8808907	45
16	4735759	7474428	6204649	1269779	8807530	44
17	4738321	7469020	6197676	1271344	8806152	43
18	4740882	7463616	6190706	1272910	8804773	42
19	4743443	7458216	6183739	1274477	8803394	41
20	4746004	7452819	6176774	1276045	8802014	40
21	4748564	7447426	6169812	1277614	8800633	39
22	4751124	7442037	6162853	1279184	8799251	38
23	4753683	7436651	6155896	1280755	8797869	37
24	3756242	7431269	6148941	1282327	8796486	36
25	4758801	7425891	6141991	1283900	8795102	35
26	4761359	7420517	6135063	1285474	8793717	34
27	4763917	7415146	6128096	1287050	8792332	33
28	4766474	7409779	6121152	1288627	8790946	32
29	4769031	7404416	6114211	1290205	8789559	31
30	4771588	7399057	6107273	1291784	8788171	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	4771588	7399057	6107273	1291784	8788171	30
31	4774144	7393701	6100337	1293364	8786782	29
32	4776700	7388349	6093404	1294945	8785393	28
33	4779255	7483001	6086474	1296527	8784003	27
34	4781810	7377657	6079547	1298110	8782613	26
35	4784365	7372316	6072622	1299694	8781222	25
36	4786919	7366979	6065700	1301279	8779830	24
37	4789473	7361646	6058781	1302865	8778437	23
38	4792026	7356316	6051863	1304453	8777044	22
39	4794579	7350990	6044948	1306042	8775650	21
40	4797132	7345668	6038036	1307632	8774255	20
41	4799684	7340349	6031126	1309223	8772859	19
42	4802236	7335034	6024219	1310815	8771462	18
43	4804787	7329723	6017315	1312408	8770065	17
44	4807338	7324415	6010413	1314002	8768667	16
45	4809888	7319111	6003514	1315597	8767267	15
46	4812438	7313811	5996618	1317193	8765868	14
47	4814988	7308514	5989723	1318791	8764468	13
48	4817537	7303221	5982831	1320390	8763068	12
49	4820086	7297931	5975941	1321990	8761665	11
50	4822633	7292645	5969054	1323591	8760263	10
51	4225183	7287363	5962170	1325193	8158860	9
52	4827731	7282084	5955288	1326796	8757456	8
53	4830278	7276809	5948409	1328400	8756051	7
54	4832825	7271538	5941533	1330005	8754646	6
55	4835371	7266270	5934659	1331611	8753240	5
56	4837917	7261006	5927787	1333219	8751833	4
57	4840462	7255746	5920918	1334828	8750425	3
58	4843007	7250489	5914051	1336438	8749016	2
59	4845552	7245236	5907187	1338049	8741607	1
60	4848096	7239987	5900326	1339661	8746197	0

29 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	4848096	7239987	5900326	1339661	8746197	60
1	4850640	7234712	5893468	1341274	8744787	59
2	4853184	7229500	5886612	1342888	8743376	58
3	4855727	7224262	5879759	1344503	8741964	57
4	4858270	7219027	5872906	1346119	8740551	56
5	4860812	7213795	5866059	1347736	8739137	55
6	4863354	7208567	5859213	1349354	8737722	54
7	4865895	7203342	5852368	1350974	8736307	53
8	4868436	7198121	5845526	1352595	8734891	52
9	4870977	7192903	5838686	1354217	8733475	51
10	4873517	7187689	5831849	1355840	8732058	50
11	4876057	7182478	5825014	1357464	8730640	49
12	4878596	7177271	5818182	1359089	8729221	48
13	4881135	7172068	5811353	1360715	8727801	47
14	4883674	8166868	5804526	1362342	8726381	46
15	4886212	7161672	5897701	1363971	8724960	45
16	4888750	7156480	5790879	1365601	8723538	44
17	4891287	7151291	5784059	1367232	8722116	43
18	4893824	7146106	5777242	1368864	8720693	42
19	4896361	7140924	5770427	1370497	8719269	41
20	4898897	7135746	5763615	1372131	8717844	40
21	4901433	7130572	5756806	1373766	8716418	39
22	4903968	7125401	5749999	1375402	8714992	38
23	4906503	7120234	5743195	1377039	8713565	37
24	4909037	7115070	5736392	1378678	8712138	36
25	4911571	7109909	5729591	1380318	8710710	35
26	4914105	7104752	5722793	1381959	8709281	34
27	4916638	7099598	5715997	1383601	8707851	33
28	4919171	7094448	5709204	1385244	8706420	32
29	4921703	7089301	5702413	1386888	8704989	31
30	4924235	7084158	5695625	1388533	8703557	30

60

29 † | —

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	4924235	7084158	5695625	1388533	8703557	30
31	4926767	7079018	5688839	1390179	8702124	29
32	4929298	7073882	5682056	1391826	8700691	28
33	4631829	7068749	5675275	1393474	8699257	27
34	4934359	7063620	5668496	1395123	8697822	26
35	4936889	7058494	5661719	1396775	8696386	25
36	4939418	7053372	5654945	1398427	8694949	24
37	4941947	7048253	5648173	1400080	8693512	23
38	4944476	7043138	5641404	1401734	8992074	22
39	4947004	7038026	5634637	1403389	8690636	21
40	4949532	7032918	5627873	1495045	8689197	20
41	4952059	7027814	5621111	1406703	8687757	19
42	4954586	7022713	5614351	1408362	8686316	18
43	4957113	7017615	5607593	1410022	8684875	17
44	4959639	7012521	5600838	1411683	8683431	16
45	4962165	7007430	5594085	1413345	8681988	15
46	4964690	7002342	5587334	1415008	8680544	14
47	4967215	6997258	5580586	1416672	8679100	13
48	4969740	6992177	5573840	1418337	8677655	12
49	4972264	6987099	5567095	1420004	8676209	11
50	4974788	6982025	5560353	1421672	8674762	10
51	4977311	6576954	5553613	1423341	8673314	9
52	4978834	6971886	5546875	1425011	8671866	8
53	4982356	6966822	5540140	1426682	8670417	7
54	4984878	6961761	5533407	1428354	8668968	6
55	4987399	6956704	5526677	1430027	8667518	5
56	4989920	6951650	5519949	1431701	8666067	4
57	4992441	6946600	5513224	1433376	8664615	3
58	4994961	6941553	5506500	1435053	8663161	2
59	4997481	6936509	5499778	1436731	8661708	1
60	5000000	6931469	5493059	1438410	8690254	0
						mi.

Gr. 60

30   † | —

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	5000000	6931469	5493059	1438410	8660254	60
1	5002519	6926432	5486342	1440090	8658799	59
2	5005038	6921399	5479628	1441771	8657344	58
3	5007556	6916369	5472916	1443453	8655888	57
4	5010074	6911342	5466206	1445136	8654431	56
5	5012591	6906319	5459498	1446821	8652973	55
6	5015108	6901299	5452792	1448507	8651514	54
7	5017624	6896282	5446088	1450194	8650055	53
8	5020140	6891269	5439387	1451882	8648595	52
9	5022656	6886259	5432688	1453571	8647134	51
10	5025171	6881253	5425992	1455261	8645673	50
11	5027686	6876250	5419298	1456952	8644211	49
12	5030200	6871250	5412605	1258645	8642748	48
13	5032714	6866254	5405915	1460339	3641284	47
14	5035227	6861261	5399227	1462034	8639820	46
15	5037740	6856271	5392541	1463730	8638355	45
16	5040253	6851285	5385858	1465427	8636889	44
17	5042765	6846302	5379177	1497125	8635423	43
18	5045277	6841323	5372499	1468824	8633956	42
19	5047788	6836347	5365822	1470525	8632488	41
20	5050299	6831374	5359147	1472227	8631019	40
21	5052809	6826405	5352475	1473930	8629549	39
22	5055319	6821439	5345805	1475634	8628079	38
23	5057829	6816476	5339137	1477339	8626608	37
24	5060338	6811516	5332471	1479045	8625137	36
25	5062847	6806560	5325808	1480752	8623665	35
26	5065355	6801607	5319147	1482460	8622192	34
27	5067863	6796657	5312488	1484169	8620718	33
28	5070370	6791710	5305831	1485879	8619243	32
29	5072877	6786767	5299177	1487590	8617768	31
30	5075384	6781827	5292525	1489302	8616292	30

30 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	5075384	6781827	5292525	1489302	8616292	30
31	5077890	6776890	5285874	1491016	8614815	29
32	5080396	6771956	5279225	1492731	8613338	28
33	5082901	6767026	5272579	1494447	8611860	27
34	5085406	6762099	5265934	1496165	8610381	26
35	5087911	6757175	5259291	1497884	8608901	25
36	5090415	6752255	5252651	1499604	8607420	24
37	5092919	6747338	5246013	1501325	8605939	23
38	5095422	6742424	5239377	1503047	8604457	22
39	5097925	6737513	5232743	1504770	8602975	21
40	5100427	6732606	5226112	1506494	8601492	20
41	5102929	6727702	5219482	1508220	8600008	19
42	5105430	6722802	5212855	1509947	8598523	18
43	5107932	6717905	5206230	1511675	8597037	17
44	5110431	6813011	5199607	1513404	8595551	16
45	5112931	6708120	5192986	1515134	8594064	15
46	5115431	6703232	5186367	1516865	8592577	14
47	5117930	6698348	5179751	1518597	8591089	13
48	5120429	66693467	5173137	1520330	8589600	12
49	5122927	6688589	5166525	1522064	8588110	11
50	5125425	6683714	5159914	1523800	8586619	10
51	5127922	6678842	5153305	1525537	8585127	9
52	5130419	6673974	514 699	1527275	8583635	8
53	5132916	6669109	5140095	1529014	8582142	7
54	5135412	6664247	5133493	1530754	8580649	6
55	5137908	6659388	5126892	1532496	8579155	5
56	5140403	6654532	5120293	1534239	8577660	4
57	5142898	6649680	5113697	1535983	8576164	3
58	5145393	6644831	5107103	1537728	8574668	2
59	5147887	6639985	5100511	1539474	8573171	1
60	5150381	6635142	5093921	1541221	8571673	0
						mi.

31 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	5150381	6635142	5093921	1541221	8571673	60
1	5152874	6630302	5087332	1542970	8570175	59
2	5155367	6625465	5080745	1547720	8568676	58
3	5157859	6620631	5074160	1546471	8567176	57
4	5160351	6615801	5067578	1548223	8565675	56
5	5162843	6610974	5060998	1549976	8564173	55
6	5165334	6606150	5054420	1551730	8562671	54
7	5167825	6601329	5047844	1553485	8561168	53
8	5170315	6596512	5041271	1555241	8559664	52
9	5172805	6591698	5034700	1556998	8558160	51
10	5175294	6586887	5028130	1558757	8556655	50
11	5177783	6582079	5021562	1560517	8555149	49
12	5180271	6577275	5014997	1562278	8553643	48
13	5182759	6572474	5008434	1564040	8552136	47
14	5185246	6567676	5001873	1565803	8550628	46
15	5187733	6562881	4995313	1567568	8549119	45
16	5190220	6558089	4988755	1569334	8547609	44
17	5192706	6553300	4982199	1571101	8546096	43
18	5195192	6548514	4975645	1572869	8544588	42
19	5197667	6543731	4969093	1574638	8543077	41
20	5200162	6538951	4962543	1576408	8541565	40
21	5202646	6534174	4955994	1578180	8540052	39
22	5205130	6529400	4949447	1579953	8538538	38
23	5207614	6524629	4942902	1581727	8537024	37
24	5210097	6519862	4936360	1583502	8535509	36
25	5212580	6515098	4929820	1585278	8533993	35
26	5215062	6510337	4923282	1587055	8532476	34
27	5217544	6505580	4916747	1588833	8530958	33
28	5220025	6500826	4910213	1590613	8529440	32
29	5222506	6496075	4903681	1592394	8527921	31
30	5224986	6491327	4897151	1594176	8526402	0

31 mi.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
30	5224985	6491327	4897151	1594176	8526402	30
31	5227466	6486583	4890624	1595959	8524882	29
32	5229946	6481842	4884098	1597744	8523361	28
33	5232425	6477103	4877573	1599530	8521839	27
34	5234904	6472367	4871050	1601317	8520317	26
35	5237382	6467634	4867529	1603105	8518794	25
36	5239800	6462904	4858010	1604894	8517270	24
37	5242337	6458177	4851493	1606684	8515745	23
38	5244814	6453453	4844978	1608475	8514220	22
39	5247290	6448732	4838465	1610267	8512094	21
40	5249766	6444014	4831954	1612060	8511167	20
41	5252241	6439299	4825444	1613855	8509639	19
42	5254716	6434588	4818937	1615651	8508111	18
43	5257191	6429880	4812432	1617448	8506582	17
44	5259665	6425175	4805929	1619246	8505052	16
45	5262139	6420473	4799427	1621046	8503522	15
46	5264612	6415774	4792927	1622847	8501991	14
47	5267085	6411078	4786429	1624649	8500459	13
48	5269557	6406385	4779933	1626452	8498927	12
49	5272029	6401695	4773439	1628256	8497394	11
50	5274501	6397008	4766947	1630061	8495860	10
51	5276972	6392324	4760456	1631868	8494326	9
52	5279443	6387643	4753967	1633676	8492791	8
53	5281913	6382965	4747480	1635485	8491255	7
54	5284383	6378290	4740995	1637295	8489718	6
55	5286852	6373618	4734512	1639106	8488180	5
56	5299321	6368949	4728031	1640918	8486641	4
57	5291789	6364283	4721552	1642731	8485102	3
58	5294257	6359620	4715074	1644546	8483562	2
59	5296725	6354961	4708599	1646362	8482022	1
60	5299192	6350305	4702126	1648179	8480481	0
						mi. Gr. 58

32

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	5299192	6350305	4702126	1648179	8480481	60
1	5301659	6345652	4695655	1649997	8478939	59
2	5304125	6341002	4689186	1651816	8477297	58
3	5306591	6336354	4682717	1653637	8475854	57
4	5309056	6331709	4676240	1655459	8474310	56
5	5311521	6327067	4669785	1657282	8472765	55
6	5313985	6322428	4663322	1659106	8471219	54
7	5316449	6317792	4656861	1660931	8469673	53
8	5318913	6313159	4050402	1662757	8468126	52
9	5321376	6308529	4643944	1664585	8466579	51
10	5323839	6303902	4637488	1666414	8465031	50
11	5326301	6299278	4631034	1668244	8463482	49
12	5328763	6294657	4624582	1670075	8461932	48
13	5331224	6190039	4618131	1671905	8460381	47
14	5333685	6285424	4611682	1673742	8458830	46
15	5336145	6280812	4605235	1675577	8457278	45
16	5388605	6276203	4598790	1677413	8455725	44
17	5341065	6271597	4592347	1679250	8454172	43
18	5343524	6266994	4585906	1681088	8452618	42
19	5345983	6262394	4579467	1682927	8451064	41
20	5348441	6257797	4573030	1684767	8449509	40
21	5350898	6253203	4566594	1686609	8447953	39
22	5353355	6248612	4560160	1688452	8446396	38
23	5355812	6244024	4553728	1690296	8444838	37
24	5358268	6239439	4547298	1692141	8443280	36
25	5360724	6234857	4540859	1693988	8441721	35
26	5363179	6230278	4534442	1695836	8440161	34
27	5365634	6225702	4528017	1697685	8438600	33
28	5368088	6221129	4521594	1699535	8437039	32
29	5370542	6216559	4515172	1701387	8435477	31
30	5372996	6211992	4508752	1703240	8423915	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	5372996	6211992	4508752	1703240	8433915	30
31	5375449	6207427	4502333	1705094	8432352	29
32	5377902	6202865	4495916	1706949	8430788	28
33	5380354	6198306	4489501	1708805	8429223	27
34	5382806	6193750	4483088	1710662	8427658	26
35	5385258	6189197	4476676	1712521	8426092	25
36	5387709	6184647	4470266	1714381	8424525	24
37	5390159	6180100	4463858	1716242	8422957	23
38	5392609	6175556	4457452	1718104	8421389	22
39	5395058	6171015	4451048	1719967	8419810	21
40	5397507	6166477	4444646	1721831	8418250	20
41	5399855	6161942	4438245	1723697	8416679	19
42	5402403	6157409	4431845	1725564	8415108	18
43	5404851	6152879	4425447	1727432	8413536	17
44	5407298	6148352	4419051	1729301	8411963	16
45	5409745	6143828	4412656	1731172	8410390	15
46	5412191	6139307	4406263	1733044	8418816	14
47	5414637	6134789	4399872	1734917	8407241	13
48	5417082	6130274	4393483	1736791	8405666	12
49	5419527	6125762	4387096	1738666	8404090	11
50	5421972	6121253	4380711	1740542	8402513	10
51	5424416	6116747	4374327	1742420	8400935	9
52	5426859	6112244	4367945	1744299	8499357	8
53	5429302	6107744	4361565	1746179	8397778	7
54	5431745	6103246	4355186	1748060	8396199	6
55	5434187	6098751	4348809	1749942	8394619	5
56	5436629	6094259	4342433	1751826	8393038	4
57	5439070	6089770	4336059	1753711	8391456	3
58	5441510	6085284	4329687	1755597	8389873	2
59	5443950	6080800	4323316	1757484	8388290	1
60	5446390	6076319	4316947	1759372	8386706	0
						mi.

33

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	5446390	6076319	4316947	1759372	8386706	60
1	5448829	6071841	4310579	1761262	8385121	59
2	5451268	6067366	4304213	1763153	8383536	58
3	5453707	6062894	4297849	1765045	8381950	57
4	5456145	6058425	4291487	1766938	8380368	56
5	5458583	6053958	4285126	1768832	8378776	55
6	5461020	6049494	4278766	1770728	8377188	54
7	5463456	6045033	4272408	1772625	8375599	53
8	5465802	6040575	4266052	1774523	8374009	52
9	5468328	6036120	4259698	1776422	8372419	51
10	5470763	6031668	4253346	1778322	8370882	50
11	5473198	6027218	4246994	1780224	8369236	49
12	5475632	6022771	4240644	1782127	8367644	48
13	5478066	6018327	4234296	1784031	8366051	47
14	5480499	6013886	4227950	1785936	8364457	46
15	5482932	6009448	4221605	1787845	8362862	45
16	5485364	6005013	4215262	1789751	8361266	44
17	5487796	6000580	4208920	1791660	8359670	43
18	5490228	5996150	4202580	1793570	8358073	42
19	5492659	5991723	4196241	1795482	8356476	41
20	5495090	5987299	4189904	1797395	8354878	40
21	5497520	5982878	4183569	1799309	8353279	39
22	5499950	5978460	4177236	1801224	8351680	38
23	5502379	5974044	4170904	1803140	8350080	37
24	5504808	5969631	4164573	1805058	8348479	36
25	5507236	5965221	4156244	1806977	8346877	35
26	5509664	5960814	4151917	1808897	8345274	34
27	5512091	5956409	4145591	1810818	8343671	33
28	5514518	5952007	4139267	1812740	8342067	32
29	5516944	5947608	4132944	1814664	8340463	31
30	5519370	5943212	4126623	1816589	8338858	30

33 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	5519370	5943212	4126623	1816589	8338858	30
31	5521795	5938829	4120314	1818515	8337252	29
32	5524220	5934438	4113996	1820442	8335646	28
33	5526645	5930050	4107680	1822370	8334039	27
34	5529069	5925665	4101366	1824299	8332431	26
35	5531493	5921273	4095043	1826230	8330822	25
36	5533916	5916893	4088731	1828162	8329212	24
37	5536338	5912516	4082421	1830095	8327602	23
38	5538760	5908142	4076113	1832029	8325991	22
39	5541182	5903771	4069807	1833964	8324280	21
40	5543603	5899402	4063501	1835901	8322768	20
41	5546024	5895036	4057197	1837839	8321155	19
42	5548444	5890673	4050895	1839778	8319541	18
43	5550864	5886313	4044594	1841719	8317927	17
44	5553283	5881955	4038294	1843661	8316312	16
45	5555702	5877600	4031996	1845604	8314696	15
46	5558120	5873248	4025700	1847548	8313079	14
47	5560538	5868899	4019405	1849494	8311462	13
48	5562956	5864552	4013111	1851441	8309844	12
49	5565373	5860208	4006819	1853389	8308226	11
50	5567790	5855867	4000529	1855338	8306607	10
51	5570206	5851529	3994241	1857288	8304987	9
52	5572622	5847193	3987953	1859240	8303367	8
53	5575037	5842860	3981667	1861193	8301746	7
54	5577452	5838530	3975383	1863147	8300124	6
55	5579866	5834203	3969101	1865102	8298501	5
56	1582280	5829878	3962819	1867059	8296877	4
57	5584693	5825556	3956539	1869017	8295253	3
58	5587106	5821237	3950261	1870976	8293628	2
59	5589518	5816920	3943984	1872936	8292002	1
60	5591929	5812606	3937709	1874897	8290376	0
						mi. Gr. 56

34 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	5591929	5812606	3937709	1874897	8290376	60
1	5594340	5808295	3931435	1876860	8288794	59
2	5596751	5803987	3925163	1878824	8287121	58
3	5599161	5799681	3918892	1880789	8285493	57
4	5601571	5795378	3912623	1882755	8283864	56
5	560[illegible]981	5791078	3906355	1884723	8282234	55
6	5606390	5786780	3900088	1886692	8280603	54
7	5608798	5782485	3893823	1888662	8278972	53
8	5611206	5778192	3887559	1890633	8277340	52
9	5613614	5773902	3881297	1892605	8275708	51
10	5616021	5769615	3875036	1894579	8274075	50
11	5618427	5765330	3868776	1896554	8272441	49
12	5620833	5761048	3862518	1898530	8270806	48
13	5623239	5756769	3856261	1900508	8269170	47
14	5625644	5752493	3850006	1902487	8267534	46
15	5628049	5748219	3843752	1904467	8265897	45
16	5630453	5743948	3837500	1906448	8264259	44
17	5632857	5739680	3831249	1908431	8262621	43
18	5635260	5735414	3824999	1910415	8260982	42
19	5637663	5731151	3818751	1912400	8259343	41
20	5640066	5726891	3812505	1914386	8257703	40
21	5642468	5722634	3806261	1916373	8256062	39
22	5644869	5718379	3800017	1918362	8254421	38
23	5647270	5714127	3793775	1920352	8252779	37
24	5649670	5709878	3787538	1922343	8251136	36
25	5652070	5705631	3781296	1924335	8249492	35
26	5654469	5701387	3775059	1926328	8247847	34
27	5656868	5697145	3768822	1928323	8246202	33
28	5659266	5692906	3762587	1930319	8244556	32
29	5661664	5688670	3756354	1932316	8242909	31
30	5664062	5684436	3750122	1934314	8241262	30

34 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	5664062	5684436	3750122	1934314	8241262	30
31	5666459	5680205	3743891	1936314	8239614	29
32	5668856	5675976	3737661	1938315	8237965	28
33	5671252	5671750	3731433	1940317	8236316	27
34	5673648	5667527	3725206	1942321	8234666	26
35	5676043	5663306	3718980	1944326	8233015	25
36	5678438	5659088	3712756	1946332	8231363	24
37	5680832	5654872	3706532	1948340	8229711	23
38	5683226	5650659	3700310	1950349	8228058	22
39	5685619	5646449	3694090	1952359	8226405	21
40	5688012	5642241	3687871	1954370	8224751	20
41	5690404	5638036	3681653	1956383	8223096	19
42	5692796	5633834	3675437	1958398	8221440	18
43	5695187	5629635	3669223	1960412	8219784	17
44	5697578	5625438	3663010	1962428	8218 27	16
45	5699968	5621244	3656799	1964445	8216469	15
46	5702358	5617052	3650588	1966464	8214810	14
47	5704747	5612863	3644379	1968484	8213151	13
48	5707136	5608676	3638171	1970505	8211491	12
49	5709524	5604492	3631965	1972527	8209831	11
50	5711912	5600311	3625761	1974550	8208170	10
51	5714289	5596132	3619557	1976575	8206508	9
52	5716686	5591956	3613355	1978601	8204846	8
53	5719072	5587782	3607154	1980628	8203183	7
54	5721458	5583611	3600954	1982657	8201519	6
55	5723844	5579443	3594756	1984687	8199854	5
56	5726229	5575277	3588559	1986718	8198188	4
57	5728613	5571114	3582364	1988750	8196522	3
58	5730997	5566953	3576169	1990784	8194855	2
59	5733381	5562795	3569976	1992819	8193188	1
60	5735764	5558639	3563784	1994855	8191520	0
						mi. Gr. 55

55

35 mi.	Sinus	Logarithmi	Differentiae	Logarithmi	Sinus	
0	5735764	5558639	3563784	1994855	8161520	60
1	5738147	5554486	3557594	1996892	8189851	59
2	5740529	5550336	3551405	1998931	8188182	58
3	5742911	5546188	3545217	2000971	8186512	57
4	5745292	5542043	3539031	2003012	8184841	56
5	5747672	5537900	3531846	2005054	8183170	55
6	5750052	5533760	3526662	2007098	8181498	54
7	5752432	5529622	3520479	2009143	8179825	53
8	5754811	5525487	3514298	2011189	8178151	52
9	5757190	5521354	3508118	2017236	8176477	51
10	5759568	5517224	3501939	2015285	8174802	50
11	5761946	5513096	3495761	2017335	8173126	49
12	5764323	5508971	3489585	2019386	8171449	48
13	5766700	5504849	3483410	2021439	8169772	47
14	5769076	5500729	3477236	2023493	8168094	46
15	5771452	5466612	3471064	2025548	8196416	45
16	5773827	5492497.	3464892	2027605	8164737	44
17	5776202	5488385	3458722	2029663	8163057	43
18	5778576	5484275	3452553	2031722	8161376	42
19	5780950	5480168	3446386	2033782	8159695	41
20	5783324	5476063	3440219	2035844	8158013	40
21	5785697	5471961	3434054	2037907	8156330	39
22	5788069	5467861	3427890	2039971	8154647	38
23	5790441	5463764	3421728	2042036	8152963	37
24	5792812	5459669	3415566	2044103	8151278	36
25	5795183	5455577	3409406	2046171	8149593	35
26	5797553	5451488	3403248	2048240	8147907	34
27	5799923	5447401	3397090	2050311	8146220	33
28	5802292	5443317	3390934	2052383	8144532	32
29	5804661	5439235	3384779	2054456	8142488	31
30	5807030	5435156	3378626	2056530	8141155	30

35

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	5807030	5435156	3378626	2056530	8141155	30
31	5809398	5431079	3372473	2058606	8139465	29
32	5811766	5427005	3366422	2060683	8137775	28
33	5814133	5422933	3360172	2062761	8136084	27
34	5816499	5418864	3354024	2064840	8134393	26
35	5818865	5414797	3347877	2066920	8132701	25
36	5821230	5410733	3341731	2069002	8131008	24
37	5823595	5406671	3335586	2071085	8129314	23
38	5825959	5402612	3329443	2073169	8127620	22
39	5828323	5398555	3323300	2075255	8125925	21
40	5830687	5394501	3317159	2077342	8124229	20
41	5833050	5390449	3311019	2079430	8122532	19
42	5835412	5386400	3304880	2081520	8120835	18
43	5837774	5382353	3298742	2083611	8119137	17
44	5840136	5378308	3292605	2085703	8117439	16
45	5842497	5374266	3286470	2087796	8115740	15
46	1844858	5370226	3280335	2089891	8114040	14
47	5847218	5366189	3274202	2091987	8112339	13
48	5849578	5362154	3268070	2094084	8110638	12
49	5851937	5358122	3261939	2096183	8108936	11
50	5854295	5354093	3255810	2098283	8107234	10
51	5856653	5350067	3249683	2100384	8105531	9
52	5859010	5346043	3243557	2102486	8104827	8
53	5861367	5342021	3237431	2104590	8102122	7
54	5863724	5338002	3231307	2106695	8100417	6
55	5866080	5333985	3225184	2108801	8098711	5
56	5868436	5329970	3219061	2110909	8097004	4
57	5870791	5325958	3212940	2113018	8095296	3
58	5873145	5321948	3206820	2115128	8093588	2
59	5875499	5317940	3200700	2117240	8091879	1
60	5877852	5313935	3194582	2119353	8090170	0
						mi.

36 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	5877852	5313935	3194582	2119353	8090170	60
1	5880205	5309932	3188465	2121467	8089460	59
2	5882558	5305932	3182350	2123582	8086749	58
3	5884910	5301935	3176236	2125699	8085038	57
4	5887262	5297940	3170123	2127817	8083326	56
5	5889613	5293947	3164011	2129936	8081613	55
6	5891964	5289957	3157900	2132057	8079899	54
7	5894314	5285969	3151790	2134179	8078185	53
8	5896664	5281984	3145682	2136302	8076470	52
9	5899013	5278001	3139575	2138426	8074754	51
10	5901361	5274020	3133468	2140552	8073038	50
11	5903709	5270042	3127363	2142679	8071321	49
12	5906056	5266066	3121259	2144807	8069603	48
13	5908403	5262092	3115155	2146937	8067885	47
14	5910750	5258121	3109053	2149068	8066166	46
15	5913096	5254152	3102952	2151200	8064446	45
16	5915442	5250186	2096853	2153333	8062726	44
17	5917787	5246222	3090754	2155468	8061005	43
18	5920132	5242261	3084657	2157604	8059283	42
19	5922476	5238302	3078561	2159741	8057561	41
20	5924820	5234346	3072466	2161880	8055838	40
21	5927163	5230392	3066372	2164020	8054114	39
22	5929505	5226441	3060280	2166161	8052389	38
23	5931847	5222492	3054188	2168304	8050664	37
24	5934189	5218545	3048097	2170448	8048938	36
25	5936530	5214601	3042008	2172593	8047212	35
26	5938871	5210659	3035919	2174740	8045485	34
27	5941211	5206720	3029832	2176888	8043757	33
28	5941551	5202783	3023746	2179037	8042028	32
29	5945890	5198848	3017660	2181188	8040299	31
30	5948228	5194916	3011576	2183340	8038569	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	5948228	5194916	3011576	2183340	8038569	30
31	5950566	5190986	3005493	2185493	8036838	29
32	5952904	5187059	2999412	2187647	8035107	28
33	5955241	5183134	2993331	2189803	8033375	27
34	5957578	5179211	2987251	2191960	8031642	26
35	5959914	5175291	2981173	2194118	8029909	25
36	5962250	5171373	2975095	2196278	8028175	24
37	5964585	5167457	2969018	2198439	8026440	23
38	5966919	5163544	2962943	2200601	8024705	22
39	5969253	5159633	2956868	2202765	8022969	21
40	5971586	5155724	2950794	2204930	8021232	20
41	5973919	5151818	2944722	2207096	8019494	19
42	5976251	5147914	2938650	2209264	8017756	18
43	5978583	5144012	2932579	2211433	8016017	17
44	5980915	5140113	2926510	2213603	8014278	16
45	5983246	5136216	2920442	2215774	8012538	15
46	5985577	5132322	2914375	2217947	8010797	14
47	5987907	5128430	2908309	2220121	8009056	13
48	5990237	5124540	2902244	2222296	8007314	12
49	5992566	5120653	2896180	2224473	8005571	11
50	5994894	5116768	2890117	2226651	8003828	10
51	5997222	5112886	2884056	2228830	8002084	9
52	5999549	5109006	2877995	2231011	8000339	8
53	6001876	5105128	2871935	2233193	7998593	7
54	6004202	5101253	2865877	2235376	7996847	6
55	6006528	5097380	2859819	2237561	7995100	5
56	6008853	5093509	2853762	2239747	7993352	4
57	6011178	5089641	2847706	2241935	7991604	3
58	6013502	5085775	2841651	2244124	7989855	2
59	6015826	5081911	2835597	2246314	7988105	1
60	6018150	5078050	2829544	2248506	7986355	0
						mi.

37

min.	Sinus	Logarithmi	Differentiæ	Logarithmi	Sinus	
0	6018150	5078050	2829544	2248506	7986355	60
1	6020473	5074191	2823492	2250699	7984604	59
2	6022796	5070334	2817441	2252893	7982852	58
3	6025118	5066479	2811391	2255088	7981100	57
4	6027439	5062627	2805342	2257285	7979347	56
5	6029760	5058777	2799294	2259483	7977593	55
6	6032080	5054929	2793247	2261682	7975838	54
7	6034400	5051084	2787201	2263883	7974084	53
8	6036719	5047241	2781156	2266085	7972328	52
9	6039038	5043401	2775113	2268288	7970572	51
10	6041357	5039563	2769071	2270492	7968815	50
11	6043675	5035727	2763029	2272698	7967057	49
12	6045992	5031894	2756989	2274905	7965299	48
13	6048309	5028063	2750949	2277114	7963540	47
14	6050625	5024234	2744910	2279324	7961780	46
15	6052940	5020408	2738873	2281535	7960020	45
16	6055255	5016584	2732836	2283748	7958259	44
17	6057570	5012762	2726800	2285962	7956497	43
18	6059884	5008942	2720764	2288178	7954735	42
19	6062198	5005125	2714730	2290395	7952972	41
20	6064511	5001310	2708696	2292614	7951208	40
21	6066824	4997497	2702663	2294834	7949443	39
22	6069136	4993687	2696632	2297055	7947678	38
23	6071448	4989879	2690602	2299277	7945912	37
24	6073759	4986073	2684573	2301500	7944146	36
25	6076069	4982270	2678545	2303725	7942379	35
26	6078379	4978469	2672518	2305951	7940611	34
27	6080688	4974670	2666492	2308178	7938842	33
28	6082997	4970873	2660467	2310406	7937073	32
29	6085306	4967079	2654444	2312635	7935303	31
30	6087614	4963287	2648421	2314866	7933533	30

37

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6087614	4963287	2648421	2314866	7933533	30
31	6089922	4959497	2642399	2317098	7931762	29
32	6092229	4955710	2636378	2319332	7929990	28
33	6094536	4951925	2630358	2321567	7928218	27
34	6096842	4948142	2624338	2323804	7926445	26
35	6099147	4944361	2618319	2326042	7924671	25
36	6101452	4940582	2612301	2328281	7922896	24
37	6103756	4936806	2606284	2330522	7921121	23
38	6106060	4933032	2600268	2772764	7919345	22
39	6108364	4929260	2594252	2335008	7917569	21
40	6110667	4925490	2588237	2337253	7915792	20
41	6112970	4921723	2582224	2339499	7914014	19
42	6115272	4917958	2576211	2341747	7912235	18
43	6117573	4914195	2570199	2343996	7910456	17
44	6119873	4910435	2564189	2346246	7908676	16
45	6122173	4906677	2558179	2348498	7906896	15
46	6124473	4902921	2552170	2350751	7905114	14
47	6126772	4899168	2546163	2353005	7903332	13
48	6129071	4895417	2540156	2355261	7901550	12
49	6131369	4891668	2534150	2357518	7899767	11
50	6133667	4887921	2528145	2359776	7897983	10
51	6135964	4884177	2522141	2362036	7896198	9
52	6138261	4880435	2516138	2364297	7894413	8
53	6140557	4876695	2510136	2366559	7892627	7
54	6142853	4872957	2504134	2368823	7897841	6
55	6145148	4869222	2498124	2371088	7889054	5
56	6147442	4865489	2492135	2373354	7887266	4
57	6149746	4861758	2486136	2375622	7885477	3
58	6152030	4858029	2480138	2377891	7883688	2
59	6154323	4854302	2474140	2380162	7881898	1
60	6156615	4850578	2468144	2382434	7880108	0
						mi. Gr.

38

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	+ —
0	6156615	4850578	2468144	2382434	7880108	60
1	6158907	4846856	2462149	2384707	7878317	59
2	6161198	4843136	2456154	2386982	7876525	58
3	6163489	4839418	2450160	2389258	7874732	57
4	6165781	4835702	2444167	2391535	7872939	56
5	6168070	4831989	2438175	2393814	7871145	55
6	6170259	4828278	2432184	2396094	7869350	54
7	6172648	4824569	2426193	2398376	7867555	53
8	6174936	4820862	2420203	2400659	7865759	52
9	6177224	4817158	2414215	2402943	7863963	51
10	6179512	4813456	2408227	2405229	7862166	50
11	6181799	4809756	2402240	2407516	7860368	49
12	6184085	4806058	2396254	2409804	7858569	48
13	6186371	4802363	2390269	2412094	7856770	47
14	6188656	4798670	2384285	2414385	7854970	46
15	6190940	4794979	2378301	2416678	7853169	45
16	6193224	4791290	2372318	2418972	7851368	44
17	6195508	4787603	2366336	2421267	7849566	43
18	6197791	4783919	2360355	2423564	7847764	42
19	6200074	4780237	2354375	2425862	7845961	41
20	6202356	4776557	2348396	2428161	7844157	40
21	6204638	4772880	2342418	2430462	7842352	39
22	6206919	4769205	2336441	2432764	7840547	38
23	6209199	4765532	2330465	2435067	7838741	37
24	6211479	4761861	2324489	2437372	7836935	36
25	6213758	4758192	2318514	2439678	7835128	35
26	6216037	4754525	2312539	2441986	7833320	34
27	6218315	4750860	2306565	2444295	7831511	33
28	6220593	4747198	2300593	2446605	7829702	32
29	6222870	4743538	2294621	2448917	7827892	31
30	6225146	4739880	2288650	2451230	7826082	30

Gr. 38

38 † |—

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6225146	4739880	2288650	2451230	7826082	30
31	6227422	4736224	2282680	2453544	7824271	29
32	6229698	4732571	2276711	2455860	7822459	28
33	6231973	4728920	2270743	2458177	7820647	27
34	6234248	4725271	2264775	2460496	7818834	26
35	6236522	4721624	2258808	2462816	7817020	25
36	6238796	4717979	2252842	2465137	7815205	24
37	6241069	4714336	2246876	2467460	7813390	23
38	6343342	4710695	2240911	2466784	7811574	22
39	6245614	4707056	2234946	2472110	7809758	21
40	6247885	4703419	2228982	2474437	7807941	20
41	6250156	4699785	2223020	2476765	7806123	19
42	6252426	4696153	2217058	2479095	7804304	18
43	6254696	4692523	2211097	2481426	7802485	17
44	6256966	4688895	2205136	2484759	7800665	16
45	6259235	4685269	2199176	2486093	7798845	15
46	6261503	4681645	2193217	2488428	7597024	14
47	6263771	5678024	2187259	2490765	7795202	13
48	6266038	4674405	2181302	2493103	7793380	12
49	6268305	4670788	2175345	2495443	7791557	11
50	6270572	4667173	2169389	2497784	7789733	10
51	6272838	4663561	2163435	2500126	7787909	9
52	6275103	4659951	2157481	2502470	7786084	8
53	6277368	4656343	2151528	2504815	7784258	7
54	6279632	4652737	2145575	2507162	7782432	6
55	6281895	4649133	2139623	2509510	7780605	5
56	6284158	4645531	2133672	2511859	7778777	4
57	6286420	4641931	2127721	2514210	7776949	3
58	6288682	4638334	2121772	2516562	7775120	2
59	6290943	4634739	2115824	2518915	7773290	1
60	6293204	4631146	2109876	2521270	7771460	0
						mi.
						Gr.

51 51

39 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	6293204	4631146	2109876	2521270	7771460	60
1	6295464	4627555	2103929	2523626	7769629	59
2	6297724	4623966	2097982	2525984	7767797	58
3	6299983	4620379	2092036	2528343	7765965	57
4	6302242	4616794	2086091	2530703	7764132	56
5	6304501	4613211	2080146	2533065	7762299	55
6	6306759	4609630	2074202	2535428	7760465	54
7	6309016	4606052	2068259	2537793	7758630	53
8	6311273	4602476	2062317	2540159	7756794	52
9	6313529	4598902	2056376	2542526	7754958	51
10	6315784	4595330	2050435	2544895	7753121	50
11	6318039	4591760	2044495	2547265	7751283	49
12	6320293	4588192	2038555	2549637	7749445	48
13	6322547	4584627	2032617	2552010	7747606	47
14	6324800	4581064	2026679	2554385	7745766	46
15	6327053	4577503	2020742	2556761	7743926	45
16	6329305	4573944	2014806	2559138	7742085	44
17	6331557	4570387	2008870	2561517	7740244	43
18	6333808	4566832	2002935	2563897	7738402	42
19	6336059	4563279	1997000	2566279	7736559	41
20	6338310	4559728	1991066	2568662	7734716	40
21	6340560	4556179	1985133	2571046	7732872	39
22	6342809	4552632	1979200	2573432	7731028	38
23	6345058	4549088	1973269	2575819	7729183	37
24	6347309	4545546	1967338	2578208	7727337	36
25	6349553	4542006	1961408	2580598	7725490	35
26	6351800	4538468	1955478	2582990	7723642	34
27	6354046	4534932	1949549	2585383	7721794	33
28	6356292	4531398	1943621	2587777	7719945	32
29	6358537	4527866	1937693	2590173	7718096	31
30	6360782	4524336	1931766	2592570	7716246	30

39 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6360782	4524336	1931766	2592570	7716246	30
31	6363026	4520808	1925839	2594969	7714395	29
32	6365170	4517282	1919913	2597369	7712544	28
33	6367513	4513758	1913988	2599770	7710692	27
34	6369756	4510236	1908063	2602173	7708839	26
35	6371999	4506717	1902140	2604577	7706986	25
36	6374241	4503200	1896217	2606983	7705132	24
37	6376482	4499685	1890295	2609390	7703277	23
38	6378722	4496172	1884373	2611799	7701422	22
39	6380962	4492661	1878452	2614209	7699566	21
40	6383201	4489152	1872531	2616621	7697710	20
41	6385440	4485645	1866611	2619034	7695853	91
42	6387678	4482140	1860692	2621448	7693995	18
43	6389916	4478637	1854773	2623864	7692137	17
44	6392153	4475136	1848855	2626281	7690278	16
45	6394390	4471637	1842937	2628700	7688418	15
46	6396626	4468140	1837020	2631120	7686549	14
47	6398862	4464646	1831105	2633541	7684687	13
48	6401097	4461154	1825190	2635964	7682835	12
49	6403332	4457664	1819276	2638388	7680973	11
50	6405566	4454176	1813363	2640813	7679110	10
51	6407799	4450690	1807450	2643240	7677246	9
52	6410032	4447206	1801537	2645669	7675382	8
53	6412264	4443724	1795625	2648099	7673517	7
54	6414496	4440244	1789714	2650530	7671652	6
55	6416728	4436766	1783803	2652963	669786	5
56	6418959	4433290	1777893	2655397	7667919	4
57	6421189	4429816	1771983	2657833	7666051	2
58	6423419	4426344	1766074	2660270	7664183	1
59	6425648	4422875	1760166	2662709	7662314	0
60	6427876	4419408	1754259	2665149	7660445	mi. Gr.

40 †

m.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	6427876	4419408	1754259	2665149	7660445	60
1	6430104	4415943	1748353	2667590	7658575	59
2	6432331	4312480	1742447	2670033	7656704	58
3	6434558	4409019	1736542	2672477	7654833	57
4	6436785	4405560	1730637	2674923	7652961	56
5	6439011	4402103	1724733	2677370	7651088	55
6	6441236	4398648	17[illegible]8829	2679819	7649215	54
7	6443461	4395195	1712926	2682269	764734[illegible]	53
8	6445685	4391743	1707022	2684721	7645466	52
9	6447909	4388193	1701119	2687174	7643591	51
10	6450132	4384845	1695216	26896[illegible]9	76[illegible]	50
11	6452355	4381399	1689314	2692085	763[illegible]838	49
12	6454577	4377955	1683412	2694543	763[illegible]	48
13	6456799	4374514	1677512	2697002	7636032	47
14	6459020	4371075	1671613	2699462	763420[illegible]	46
15	6461240	4367638	1665714	2701924	76323[illegible]	[illegible]
16	6463460	4364203	1659816	2704387	7630445	44
17	6465679	4360770	1653918	2706852	7628564	43
18	6467898	4357339	1648021	2709318	7626683	42
19	6470116	4353910	1642124	2711786	7624802	41
20	6472333	4350483	1636228	2714255	7622920	40
21	647[illegible]550	4347058	1630332	2716726	7621037	39
22	6476766	4343635	1624437	2719198	7619153	38
23	6478982	4340214	1618542	2721672	7617269	37
24	6481198	4336795	1612648	2724147	7615384	36
25	6483413	4333378	1606755	2726623	7613498	35
26	[illegible]485628	4329963	1600862	2729101	7611612	34
27	6487842	4326550	1594970	2731580	7609725	33
28	6490055	4323993	1589078	2734061	7607837	32
29	592 268	4319730	1583187	273[illegible]543	76059[illegible]9	31
30	6494480	4316323	1577296	2739027	7604060	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6494480	4316323	1577296	2739027	7604060	30
31	6496692	4312919	1571407	2741512	7602170	29
32	6498903	4309517	1565518	2743999	7600280	28
33	6501114	4306116	1559629	2746487	7598389	27
34	6503324	4302717	1553740	2748977	7596498	26
35	6505533	4299320	1547852	2751468	7594606	25
36	6507742	4295925	1541964	2753961	7592713	24
37	6509950	4292532	1536077	2756455	7590819	23
38	6512158	4289141	1530191	2758950	7588925	22
39	6514365	4285752	1524305	2761447	7587031	21
40	6516572	4282365	1518420	2763945	7589136	20
41	6518778	4278980	1512535	2766445	7583240	19
42	6520984	4275597	1506651	2768946	7581343	18
43	6523189	4272216	1500767	2771449	7579446	17
44	6525394	4268837	1494884	2773953	7577548	16
45	6527598	4265460	1489001	2776459	7575650	15
46	6529801	4262085	1483119	2778966	7573751	14
47	6532004	4258712	1477237	2781475	7571851	13
48	6534206	4255341	1471356	2783985	7569951	12
49	6536408	4251972	1465476	2786496	7568050	11
50	6538609	4248605	1459596	2789009	7566148	10
51	6540809	4245240	1453717	2791523	7564246	9
52	6543009	4241877	1447838	2794039	7562343	8
53	6545208	4238516	1441960	2796556	7560439	7
54	6547407	4235157	1436082	2799075	7558535	6
55	6549606	4231800	1430205	2801595	7556630	5
56	551804	4228445	1424328	2804117	7554724	4
57	6554001	4225092	1418451	2806641	7552818	3
58	6556198	4221741	1412575	2809166	7550911	2
59	6558394	4218392	1406699	2811693	7549004	1
60	6560590	4215044	1400823	2814221	7547096	0
						mi.

41

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	6560590	4215044	1400823	2814221	7547096	60
1	6562785	4211698	1394947	2816751	7545187	59
2	6564979	4208354	1389072	2819282	7543277	58
3	6567173	4205012	1383197	2821815	7541367	57
4	6569367	4201672	1377323	2824349	7539457	56
5	6571560	4198334	1371450	2826884	7537546	55
6	6573753	4194999	1365578	2829421	7535634	54
7	6575945	4191666	1359707	2831959	7533721	53
8	6578136	4188335	1353836	2834499	7531808	52
9	6580326	4185006	1347966	2837040	7529894	51
10	6582516	4181679	1342097	2839582	7527980	50
11	6584705	4178354	1336228	2842126	7526065	49
12	6586894	4175030	1330358	2844672	7524149	48
13	6589082	4171708	1324489	2847219	7522233	47
14	6591270	4168388	1318620	2849768	7520316	46
15	6593458	4165070	1312752	2852318	7518398	45
16	6595645	4161754	1306884	2854870	7516840	44
17	6597831	4158440	1401017	2857423	7514561	43
18	6600016	4155128	1295150	2859978	7512642	42
19	6602201	4151818	1289284	2862534	7510722	41
20	6604386	4148510	1283418	2865092	7508801	40
21	6606570	4145204	1277553	2867651	7506879	39
22	6608753	4141900	1271688	2870212	7504957	38
23	6610936	4138508	1265824	2872774	7503034	37
24	6613118	4135298	1259960	2875338	7501111	36
25	6615300	4132000	1254097	2877903	7499187	35
26	6617481	4128703	1248233	2880470	7497262	34
27	66196 1	4125408	1242370	2883038	7495336	33
28	6621841	4122115	1236507	2885608	7493410	32
29	6624021	4118824	1230645	2888179	7491484	31
30	6626200	4115535	1224783	2890752	7489557	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6626200	4115535	1224783	2890752	7489557	30
31	6628379	4112248	1218922	2893326	7487629	29
32	6630557	4108963	1213061	2895902	7485700	28
33	6632734	4105680	1207201	2898479	7483771	27
34	6634911	4102399	1201341	2901058	7481842	26
35	6637087	4099120	1195482	2903638	7479912	25
36	6639263	4095843	1189623	2906220	7477981	24
37	6641438	4092567	1183763	2908804	7476049	23
38	6643612	4089293	1177904	2911389	7474117	22
39	6645786	4086021	1172045	2913976	7472184	21
40	6647959	4082751	1166187	2916564	7470251	20
41	6650132	4079483	1160329	2919154	7468317	19
42	6652304	4076217	1154472	2921745	7466382	18
43	6654476	4072953	1148615	2924338	7464447	17
44	6656647	4069691	1142759	2926932	7462511	16
45	6658817	4066431	1136904	2929527	7460574	15
46	6660987	4063173	1131049	2932124	7458637	14
47	6663156	4059917	1125195	2934722	7456699	13
48	6665325	4056663	1119341	2937322	7454761	12
49	6667493	4053410	1113487	2939923	7452822	11
50	6669661	4050159	1107633	2942526	7450882	10
51	6671828	4046910	1101780	2945130	7448941	9
52	6673994	4043663	1095927	2947736	7447000	8
53	6676160	4040418	1090074	2950344	7445058	7
54	6678326	4037175	1084222	2952953	7443116	6
55	6680491	4033934	1078370	2955564	7441173	5
56	82655	030695	1072518	2958177	7439229	4
5	6684818	4027458	1066667	1960791	7437284	3
5	6686[illegible]1	4024223	1060816	2963407	7435339	2
5	6689144	4020990	1054966	2966024	7433394	1
60	6691306	4017759	1049116	2968643	7431448	0
						mi.

42 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	6691306	4017759	1049116	2968643	7431448	60
1	6693468	4014529	1043266	2971263	7429501	59
2	6695629	4011301	1037416	2973885	7427553	58
3	6697789	4008075	1031567	2976508	7425605	57
4	6699949	4004851	1025718	2979133	7423657	56
5	6702108	4001629	1019870	2981759	7421708	55
6	6704267	3998409	1014023	2984386	7419758	54
7	6706425	3995191	1008176	2987015	7417807	53
8	6708582	3991974	1002329	2989645	7415856	52
9	6710739	3988759	996482	2992277	7413905	51
10	6712895	3985546	990636	2994910	7411953	50
11	6715051	3982335	984790	2997545	7410000	49
12	6717206	2979126	978944	3000182	7408046	48
13	6719361	3975919	973099	3002820	7406092	47
14	6721515	3972714	967254	3005460	7404137	46
15	6723668	3969511	961409	3008102	7402181	45
16	6725821	3966310	955565	3010745	7400225	44
17	727973	3963110	949720	3013390	7398268	43
18	6730125	3959912	943876	3016036	7396311	42
19	6732276	3956716	938032	3018684	7394353	41
20	6734427	3953522	932189	3021333	7392394	40
21	6736577	3950330	926346	3023984	7390435	39
22	738726	3947140	920504	3026636	7388475	38
23	6740875	3943951	914661	3029290	7386515	37
24	6743024	3940764	908819	3031945	7384554	36
25	6745172	3937579	902977	3034602	7382592	35
26	6747319	3934396	8971 35	3037261	7380629	34
27	6749465	3931215	891294	3039921	7378666	33
28	6751611	3928035	885453	3042583	7376702	32
29	6753757	3924859	879613	3045246	7374738	31
30	6755902	3921684	873773	3047911	7372773	30

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6755902	3921684	873773	3047911	7372773	30
31	2758047	3918511	867934	3050577	7370807	29
32	6760191	3915339	822094	3053245	7368841	28
33	6762334	3912169	856255	3055914	7366874	27
34	6764477	3909001	850416	3058585	7364907	26
35	6766619	3905835	844577	3061258	7362939	25
36	6768760	3902671	838739	3063932	7360970	24
37	6770901	3899509	832901	3066608	7359001	23
38	6773041	3896348	827063	3069285	7357031	22
39	6775181	3893189	821225	3071964	7355061	21
40	6777320	3890032	815388	3074644	7353090	20
41	6779459	3886877	809551	3077326	7351118	19
42	6781597	3883723	803714	3080009	7349145	18
43	6783734	3880571	797877	3082694	7347173	17
44	6785971	3877421	792041	3085380	7345199	16
45	6788007	3874273	786205	3088068	7343225	15
46	6790143	3871127	780369	3090758	7341250	14
47	6792278	3867983	774534	3093449	7339274	13
48	6794413	3864841	768699	3096142	7337298	12
49	6796547	3861701	762865	3098836	7335322	11
50	6798681	3858563	757031	3101532	7333345	10
51	6800814	3855426	751197	3104229	7331367	9
52	6802946	3852291	745363	3106928	7329388	8
53	6805078	3849158	7 9529	3109629	7327409	7
54	6807209	3846027	733696	3112331	7325429	6
55	6809340	3842898	727863	3115035	7323449	5
56	6811470	3839770	722029	3117741	7321468	4
57	6813599	3836644	716196	3120448	7319486	3
58	6815728	3833520	710363	3123157	7317504	2
59	6817856	3830398	704530	3125868	7315521	1
60	6819984	3827278	698698	3128580	7313537	0
						mi.

43. m:	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	6819984	3827278	698698	3028580	7313537	60
1	6822111	3824160	692866	3131294	7311553	59
2	6824237	3821044	687035	3134009	7309568	58
3	6826363	3817929	681203	3136726	7307583	57
4	6828489	3814816	675372	3139444	7305597	56
5	6830614	3811705	669541	3142164	7303610	55
6	6832738	3808596	663711	3144885	7301623	54
7	6834861	3805488	657880	3147608	7299635	53
8	6836984	3802382	652050	3150332	7297647	52
9	6839107	3799278	646221	3153057	7295658	51
10	6841229	3796176	640392	3155784	7293668	50
11	6843350	3793075	634562	3158513	7291678	49
12	6845471	3789976	628732	3161244	7289687	48
13	6847591	3786879	622903	3163976	7287695	47
14	6849711	3783784	617074	3166710	7285703	46
15	6851830	3780691	611246	3169445	7283710	45
16	6853949	3777600	605418	3172182	7281722	44
17	6856067	3774510	599589	3174921	7281716	43
18	6858184	3771422	593760	3177662	7277728	42
19	6860301	3768336	587932	3180404	7275733	41
20	6862417	3765252	582104	3183148	7273737	40
21	6864533	3762170	576277	3185893	7271741	39
22	6866648	3759090	570450	3188640	7269744	38
23	6868762	3756011	564622	3191389	7267746	37
24	6870876	3752934	558795	3194139	7265748	36
25	6872989	3749859	552968	3196891	72[illegible]37[illegible]9	35
26	6875102	3746786	547142	3199644	7261749	34
27	6877214	3743714	541315	3202399	7259748	33
28	6879325	3740644	545489	3205155	7257747	32
29	6881436	3737576	529663	3207913	7255746	31
30	6883546	3734510	523838	3210672	7253744	30

43 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	6883546	3734110	523838	3210672	7253744	30
31	6885656	3731446	518013	3213435	7251741	29
33	6887765	3728383	512187	3216196	7249737	28
33	6889874	3725322	506361	3218961	7247733	27
34	6891982	3722263	500536	3221727	7225749	26
35	6849989	3719206	494711	3224495	7243724	25
36	6896196	3716150	488886	3227264	7241718	24
37	6898302	3713096	483061	3230035	7239711	23
38	6900408	3710044	477236	3232808	7237704	22
39	6902513	3706994	471411	3235583	7235697	21
40	6904617	3703946	465587	3238359	7233689	20
41	6906721	3700899	459762	3241137	7231681	19
42	6908824	3697854	453938	3243916	7229672	18
43	6910927	3694811	448114	3246697	7227662	17
44	6913029	3691770	442291	3349479	7225651	16
45	6915131	3688730	436467	3252263	7223639	15
46	6917232	3685692	430644	3255048	7221627	14
47	6919332	3682656	424821	3257835	7219614	13
48	6921432	3679622	418999	3260623	7217601	12
49	6923531	3676590	413177	3263413	7215588	11
50	6925630	3673559	407355	3266204	7213574	10
51	6927728	3670530	401533	3268997	7211559	9
52	6929825	3667503	395711	3271792	7209543	8
53	6931922	3664478	389889	3274589	7207527	7
54	6934018	3661454	384067	3277387	7305511	6
55	6936114	3658432	378245	3280187	7203494	5
56	6938209	3655412	372423	3282989	7201476	4
57	6940303	3652394	366602	3285792	7199457	3
58	6942397	3649377	360780	3288597	7197438	2
59	6944491	3646362	354958	3291404	7195418	1
60	6946584	3643349	349136	3294213	7193398	0
						mi. Gr. 46

14

mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
0	6946584	3643349	349136	3294213	7193398	60
1	6948676	3640338	343315	3297023	7191377	59
2	6950767	3637329	337494	3299835	7189355	58
3	6952858	3634321	331673	3302648	7187333	57
4	6954949	3631315	325852	3305463	7185310	56
5	8957039	3628311	320032	3308279	7183287	55
6	6959128	3625308	314211	3311097	7181263	54
7	6961216	3622307	308390	3313917	7179238	53
8	6963304	3619308	302570	3316738	7177213	52
9	6965392	3616311	296750	3319561	7175187	51
10	6967479	3613315	290930	3322385	7173161	50
11	6969565	3610321	285110	3325211	7171134	49
12	6971651	3607329	279290	3328039	7169106	48
13	6973736	3604338	273469	3330869	7167078	47
14	6975821	3601349	267649	3333700	7165049	46
15	6977905	3598362	261829	3336533	7163019	45
16	6979988	3595377	256009	3339368	7160989	44
17	6982071	3592394	250190	3342204	7158958	43
18	6984153	3589412	244370	3345042	7156927	42
19	6986235	3586432	238550	3347882	7154895	41
20	6988316	3583454	232731	3350723	7152863	40
21	6990396	3580478	226912	3353566	7150830	39
22	6992476	3577504	221093	3356411	7148796	38
23	6994555	3574531	215274	3359257	7146762	37
24	6996634	3571560	209455	3362105	7144727	36
25	6998712	3568590	203635	3364955	7142691	35
26	7000789	3565622	197616	3367806	7140655	34
27	7002866	3562656	191997	3370659	7138618	33
28	7004942	3559691	186178	3373513	7136581	32
29	7007018	3556728	180359	3376369	7134543	31
30	7009093	3553767	174541	3379226	7132504	30

45

44 mi.	Sinus	Logarithmi	Differentia	Logarithmi	Sinus	
30	7009093	3553767	174541	3379226	7132504	30
31	7011167	3550808	168723	3382085	7130465	29
32	7013241	3547851	162905	3384946	7128225	28
33	7615314	3544895	157087	3387808	7126385	27
34	7017387	3541941	151269	3390672	7124344	26
35	7019459	3538989	145451	3393538	7122303	25
36	7021530	3536038	139633	3396406	7120261	24
37	7023601	3533089	133814	3399275	7118218	23
38	7025671	3530142	127996	3402146	7116175	22
39	7027741	3527197	122178	3405019	7114131	21
40	7029810	3524243	116359	3407894	7112086	20
41	7031879	3521311	110541	3410770	7110041	19
42	7033947	3518371	104723	3413648	7107995	18
43	7036014	3515432	98904	3415528	7105949	17
44	7038081	3512495	93886	3419409	7103902	16
45	7040147	3509560	87268	3422292	7101854	15
46	7042213	3506626	81450	3425176	7099806	14
47	7044278	3503694	75632	3428062	7097757	13
48	7046342	3500764	69824	3430940	7095708	12
49	7048406	3497835	64006	3433829	7093658	11
50	7050469	3494908	58178	3436730	7091607	10
51	7052532	3491983	52360	3439623	7089556	9
52	7054594	3489060	46543	3442517	7087504	8
53	7056655	3486139	40726	3445413	7085452	7
54	7058716	3483219	34908	3448311	7083399	6
55	7060776	3480301	29090	3451211	7081345	5
56	7062386	3477385	23273	3454112	7079291	4
57	7064895	3474470	17455	3457015	7077236	3
58	7066953	3471557	11637	3459920	7075181	2
59	7069011	3468645	5818	3462827	7073125	1
60	7071068	3465735	0	3465735	7071068	0
						mi. Gr. 45.

Extraict du Priuilege du Roy.

SVivant le Priuilege & mandement de S. M. à tous Preuosts des terres de son obeissance, & à tous ses amez Iusticiers & Officiers, & à chascun d'eux appartiendra, ainsi qu'il est permis à Barthelemy Vincent Marchand Libraire à Lyon, d'Imprimer vendre & debiter ledict Liure intitulé *Logarithmorum Canonis descriptio, seu Arithmeticarum supputationum mirabilis abbreuiatio. Eiusque vsus in vtraque Trigonometria vt etiam in omni Logistica Mathematica, amplissimi, facillimi & expeditissimi explicatio. Authore ac Inuĕtore Ioanne Nepero:* Barone *Merchistonij, &c.* durant le temps & espace de neuf ans, à commencer du iour & datte de ladicte Impression paracheuee: auec deffences à toutes personnes de quelque estat, vacation & condition qu'ils soyent d'en vendre ou debiter, ny d'en estre saisi d'vn ou plusieurs exemplaires autres que de ceux imprimez par ledict Vincent, à peyne de confiscation des exemplaires, & autres peines portees par iceluy, qui fust donné à Paris les iour, mois & an y contenu. Signé & deuëment seellé du grand seel de cire iaune.

Acheué d'Imprimer le premier Octobre, mil six cents dixneuf.

MIRIFICI LOGARITHMORVM CANONIS CONSTRVCTIO;

ET EORVM AD NATVRALES ipſorum numeros habitudines;

VNA CVM APPENDICE, DE ALIA eâque præſtantiore Logarithmorum ſpecie condenda.

Quibus acceſſere Propoſitiones ad triangula ſphærica faciliore calculo reſoluenda:

Vnà cum Annotationibus aliquot doctiſsimi D. HENRICI BRIGGII *in eas, & memoratam appendicem.*

Authore & Inuentore IOANNE NEPERO, Barone MERCHISTONII, &c. Scoto.



LVGDVNI,
Apud Bartholomæum Vincentium,
ſub Signo Victoriæ.

M. DC.XX.

Cum priuilegio Cæſar. Maieſt. & Chriſt. Galliarum Regis.

ROBERTVS NEPERVS AVCTORIS FILIVS LECTORI MATHESEOS STVDIOSO.

S.

ANTE aliquot annos (Lector Philomathes) Mirifici Logarithmorum Canonis vsum, memoriæ semper colendæ parens publici Iuris fecerat; eius verò syntaxin ac creandi methodum, vt ipse monuit. Pag. 7ª. & vltimâ Logarithmorum, certo consilio Typis committere noluit; donec quodnam esset eorum, qui in hoc doctrinæ genere versati sunt, de hoc Canone Iudicium ac censura exploratum habuisset. Mihi verò, post ipsius ex hâc vitâ commigrationem certis tecmeriis constat, Mathematicarum disciplinarum peritissimos nouum hoc Inuentum plurimi facere; & nihil iis gratius accidere posse, quàm si Mirifici huius Canonis constructio, aut ea saltem, quæ ipsi aliquid lucis afferre possint, publicæ vtilitatis gratiâ in lucem prodeant. Quamuis igitur mihi probè perspectum sit, ipsum authorem huic opusculo extremam manum non imposuisse; feci tamen quantum in me fuit, vt horum honestissimo desiderio satisfieret; eorumque studiis præsertim qui imbecilliores sunt, & in ipso limine hærere solent, hac in parte consuleretur. Nec dubito, quin hoc opus posthumum multò perfectius ac elimatius in lucem prodiisset, si ipsi authori patri charissimo (in quo, ex optimorum hominum sententiâ, inter alia præclara hoc eximiè eminebat; res difficillimas methodo certâ & facili, quàm

paucissimis expedire) Deus longiorem vitæ vsuram concessisset. Habes igitur (Lector beneuole) in hoc libello, doctrinam constructionis Logarithmorum (quos hic numeros artificiales appellat ? hunc enim tractatum, ante inuentam Logarithmorum *vocem, apud se pro aliquot annos conscriptum habuerat) copiosissimè explicatam ? in qua eorum natura, symptomata, ac variæ ad naturales eorum numeros habitudines perspicuè demonstrantur. Visum est etiam ipsi syntaxi subnectere Appendicem quandam, de alia Logarithmorum specie multò præstantiore condenda, (cujus, ipse Inuentor in Epistola* Rabdologiæ *suæ præfixa meminit) & in qua Logarithmus vnitatis est 0. Hanc loco vltimo vltimus ejus labor excipit, ad vlteriorem Trigonometriæ suæ Logarithmicæ perfectionem spectans ? nempe propositiones quædam eminentissimæ, in Triangulis sphæricis non quadrantalibus resoluendis, absque eorum in quadrantalia aut rectangula diuisione, & absque casuum obseruatione: quas quidem Propositiones in ordinem redigerè, & ordine demonstrare statuerat, nisi nobis morte præproperâ præreptus fuisset. Lucubrationes etiam aliquot, Mathematici excellentissimi* D. Henrici Briggij *publici apud* Londinenses *Professoris, in memoratas Propositiones, & nouam hanc Logarithmorum speciem, Typis mandari curauimus ? qui noui huius Canonis supputandi laborem grauissimum, pro singulari amicitia quæ illi cum Patre meo* L. M. *intercessit, animo libentissimo in se suscepit; creandi methodo, & vsuum explanatione Inuentori relictis. Nunc autem ipso ex hac vita euocato, totius negotij onus doctissimi* Briggij *humeris incumbere, & Sparta hæc ornanda illi sorte quadam obtigisse videtur. Hisce interim (Lector) laboribus quibuscunque fruere, & pro humanitate tua boni consulito.* Vale.

MIRIFICI

MIRIFICI LOGARITHMORVM CANONIS CONSTRVCTIO; (QVI ET TABVLA ARTIFICIALIS AB AVTHORE deinceps appellatur) eorumque ad naturales ipsorum numeros habitudines.

POSITIO PRIMA.

*TABVLA * Artificialis, est minima Tabula, cuius operâ facillimo computu omnium Geometricarum dimensionum, motuumque sublimium habetur notitia.* † Logarithm.

HÆc meritò minima dicitur, quia Tabulam sinuum volumine non exsuperat: facillima, quia per eam omnes multiplicationes, diuisiones, extractionesque radicum grauiores euitantur: solis enim & perpaucis facillimisque additionibus, substractionibus, & bipartitionibus omnes generaliter figuras motusque metitur.

Hæc è numeris proportione continua progredientibus excerpitur.

Pos. 2. *Continuarum progressionum, alia Arithmetica quæ per æqualia interualla progreditur: Alia Geometrica, quæ per inæqualia & proportionaliter crescentia, aut deficientia incedit.*

Arithmetica progessio, vt 1, 2, 3, 4, 5, 6, 7, &c. vel 2, 4, 6, 8, 10,

12,14,16,&c. Geometrica verò, vt 1,2,4,8,16,32,64, &c. vel 243,81,27,9,3,1,

3. *In progressionibus requiritur accuratio, & operis facilitas. Accuratio fit, pro fundamento numeros maiores accipiendo: maiores autem numeri ex minoribus facillimè fiunt adiectis cyphris.*

Vt pro 100000, quem rudiores sinum maximum faciunt, eruditiores ponunt 10000000, quò meliùs omnium sinuum discrimen exprimatur. Vnde & eodem nos pro sinu toto & maximo proportionalium Geometricorum vtimur.

4. *In Tabulis computandis etiam ex numeris maioribus maximi fiant, interpositâ periodo inter numerum ipsum & cyphras adiectas.*

Vt ex 10000000, nos initio computationis facimus 10000000.0000000, ne minutissimus error frequenti multiplicatione in immensum cresceret.

5. *In numeris periodo sic in se distinctis, quicquid post periodum notatur fractio est, cuius denominator est vnitas cum tot cyphris post se, quot sunt figuræ post periodum.*

Vt 10000000.04, valet idem, quod $10000000\frac{4}{100}$. Item 25.803. idem quod $25\frac{803}{1000}$ Item 9999998.0005021, idem valet quod $9999998\frac{5021}{10000000}$. & sic de cæteris.

lege $25\frac{803}{1000}$

6. *E Tabulis iam computatis, reiici possunt fractiones post periodum locatæ, absque vllo sensibili errore. In magnis enim nostris numeris error insensibilis, & quasi nullus habetur, qui vnitatem non exsuperat.*

Vt completâ Tabulâ pro 9987643.8213051, qui sunt $9987643\frac{8213051}{10000000}$, accipi possunt hi 9987643. absque sensibili errore.

7. *Est præterea alia accurationis formula: quum scilicet quantitas ignota, seu numero inexplicabilis, inter terminos numerales pluribus vnitatibus non differentes includitur.*

Vt positâ Diametro circuli partium 497, quia nescitur præcisè quot partium sit ambitus, ideo eruditiores ex Archimedis sententiâ, eum inter terminos 1562, & 1561 incluserunt. Item si costarum quadrati quælibet sit partium 1000, erit diagonalis radix

lis radix quadrata numeri 2000000, quæ cùm sit numero inexplicabilis, ideò per extractionem radicis quadratæ quæruntur eius termini, scilicet 1415 terminus maior, & 1414 terminus minor, vel $1414\frac{604}{2828}$ maior, & $1414\frac{604}{1829}$ minor: videlicet quanto minor terminorum differentia sit, tanto maior accuratio.

8. *Vice ipsarum quantitatum ignotarum, termini earum sunt addendi, substrahendi, multiplicandi, aut diuidendi prout opus fuerit.*

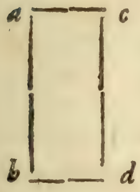
9. *Adduntur bini alicuius quantitatis termini ad binos terminos alterius, quum minor illius minori huius, & maior illius maiori huius additur.*

Vt sit linea *a b c*, in duas quantitates *a b*, & *b c* diuisa;



sit *a b* inter terminos 123.5 maiorem, & 123.2 minorem: sitque *b c* inter terminos 43. 2. maiorem, & 43. 1 minorem. Additis ergo maiore ad maiorem, & minore ad minorem, fiet tota quantitas *a c* inter terminos 166,7 & 166. 3.

Multiplicantur bini alicuius quantitatis termini per binos terminos alterius, quum minor illius in minorem huius, & maior illius in maiorem huius ducitur.



Vt sit altera quantitas *a b*, quæ sit inter terminos 10.502 maiorem, & 10.500 minorem; altera verò *a c*, quæ sit inter terminos 3. 216 maiorem, & 3. 215 minorem. Vnde ductis 10.502 in 3. 216, & 10. 500 in 3. 215, prouenient termini 33. 774432, & 33. 757500; inter quos erit area *a b c d*.

10. *Terminorum substractio fit, terminum maiorem minoris quantitatis à minore maioris, & minorem minoris à maiore maioris auferendo.*

Vt in schemate primo, si ex terminis *a c*, qui sunt 166.7 & 166.3, subduxeris terminos *b c*, qui sunt 43. 2 & 43. 1, fient 123.6 & 123.1 pro terminis *a b*; & non 123. 5 & 123. 2. Nam licet etiam horum additio ad 43. 2 & 43.1, producebat 166.7 & 166. 3, (per octauam) non tamen è conuerso sequetur

quetur, quin aliquid possit esse inter 166.7 & 166.3, ex quo si substraxeris aliquid quod sit inter 43.2 & 43.1, remaneret id quod non sit inter 123.5 123.2: verùm non esse id inter terminos 123.6 & 123.1 est impossibile.

11. *Diuisio fit, partiendo terminum maiorem diuidendi per minorem diuisoris, & minorem diuidendi per maiorem diuisoris.*

Vt in præcedente figura, quadratum *a b c d* inter terminos 33 774432 & 33.757500 constitutum diuidatur per terminos *a c*, qui sunt 3.216 & 3.215, prouenient 10.505.$\frac{857}{3215}$ & 10.496 $\frac{2364}{3216}$ pro terminis *a b*; & non 10.502 & 10.500, eâdem ratione, quam in substractione diximus.

12. *Rudes terminorum fractiones delendæ sunt addita vnitate ad terminum maiorem.*

Vt pro terminis *a b* præcedentibus, scilicet 10.505.$\frac{857}{3215}$ & 10.496$\frac{2364}{3210}$, capiantur 10.506 & 10.496.

Hactenus de accuratione, sequitur de facilitate operis.

12. *Omnis progressionis Arithmeticæ facilis est constructio, Geometricæ autem non omnis.*

Patet hoc, siquidem additione & substractione fit facillimè Arithmetica progressio: geometrica verò, difficillimis multiplicationibus, diuisionibus, & radicū extractionibus continuatur.

Solæ Geometricæ illæ progressiones facilè continuantur, quæ per substractionem facilis partis numeri à numero toto oriuntur.

14. *Partes numeri faciles dicimus, partes quaslibet cuius denominationes vnitate & cyphris quotcunque notantur: habentur autem hæ partes, reiiciendo tot figuras vltimas principalis numeri, quot sunt cyphræ in denominatore.*

Vt partes decima, centesima, millesima, 10000ª, 100000ª, 1000000ª, 10000000ª, faciles dicuntur, quia cuiuslibet numeri decima pars habetur delendo eius vltimam figuram; centesima duas vltimas, millesima tres vltimas figuras, & sic de cæteris, semper delendo tot figuras vltimas quot sunt cyphræ in denominatione partis. Vt decima pars huius 99321 est 9332, eius autem centesima est 993, millesima 99, &c.

15. *Mediocriter etiam facilè habentur partes dimidia, vigesima,* *ducen-*

ducentesima, & aliæ per binarium & cyphras denominatæ; reiiciendo tot figuras vltimas principalis numeri, quot sunt cyphræ in denominatore, & reliquum bipartiendo.

Vt numeri 9973218045 pars 2000a est 4986609, pars 20000a est 498660.

16. *Hinc sequitur, si à sinu toto septem cyphris aucto, cæterisque inde ortis suam 10000000am partem substraxeris, continuari possunt quam facillimè centum numeri, in ea proportione Geometrica, quæ est inter sinum totum & sinum eo minorem vnitate, scilicet 10000000 & 9999999; hancque seriem proportionalium primam Tabulam nominamus.*

Prima Tabula.

10000000.0000000
1.0000000
____
9999999.0000000
9999999
____
9999998.0000001
9999998
____
9999997.0000003
9999997
____
9999996.0000006

continuando vsque ad

9999900.0004950

Vt ex sinu toto aucto septem cyphris (maioris accurationis gratiâ) sic 10000000.0000000 aufer 1.0000000, fient 9999999.0000000: ex quibus aufer 9999999, fient 9999998.0000001; & sic prosequaris vt à latere, donec centum creaueris proportionalia, quorum vltimum (si rectè computaueris) erit 9999900.0004950.

17. *Tabula secunda progreditur à sinu toto sex cyphris aucto, per quinquaginta numeros alios deficientes proportionaliter, ea proportione quæ facillima est, & quàm proxima proportioni, quæ est inter primum & vltimum primæ Tabulæ.*

Secunda Tabula.

10000000. 0000000
100. 000000
9999900. 000000
99. 999000
9999800. 001000
99. 998000
9999700. 003000
99. 997000
9999600. 006000
&c. vsque ad
9995001. 222927

Vt primæ Tabulæ primum & vltimum sunt 10000000.0000000, & 9999900.0004950; in quorum proportione, difficile est constituere quinquaginta proportionales numeros. Proxima itaque facilis proportio, est 100000 ad 99999; quæ continuatur satis exactè adiiciendo sinui toti sex cyphras, & auferendo ab antecedente suam partem 100000^{am}, vt fiat subsequens, vt à latere vides: & hæc Tabula præter primum qui est sinus totus, etiam quinquaginta contineat proportionales numeros, quorum vltimum (ni erraueris) reperies esse 9995001. 222927.

18. *Tertia Tabula sexaginta nouem columnis constat, & in qualibet columna ponuntur numeri viginti & vnus, progredientes ea proportione quæ facillima est, & quàm proxima illi proportioni quæ est inter primum & vltimum secundæ Tabulæ.*

Vnde huius prima columna facillimè habetur à sinu toto quinque cyphris aucto, & à cæteris inde ortis suam 2000^{am} partem auferendo.

Prima Columna tertiæ Tabulæ.

10000000. 00000
5000. 0000
9995000. 00000
4997. 50000
9990002. 50000
4995. 00125
9985007. 49875
4992. 50374
9980014. 99501
&c. vsque ad
9900473. 57808

Vt quia inter 10000000: 000000 primum secundæ tabulæ, & 9995001. 222927 eiusdem vltimum, proportio difficilis est progressionis; ideò in proportione facili 10000 ad 9995 (quæ illi propinqua satis est) constituendi sunt numeri viginti & vnus; quorum vltimus (ni erraueris) erit 9900473. 57808. A quibus iam creatis, reiici potest vltima singulorum figura absque sensibili errore, quò faciliùs ab iis alij posteà creentur.

Primi

19. *Primi numeri omnium columnarum, progrediuntur à sinu toto quatuor cyphris aucto, eâ proportione facillimâ & proximâ proportioni, quæ est inter primum & vltimum primæ columnæ.*

Vt primæ columnæ primus & vltimus sunt 10000000.0000, & 9900473.5780: his proportio facillima maximè propinqua est 100 ad 99. A sinu igitur toto continuandi sunt 68 numeri in ratione 100 ad 99, auferendo à quolibet eorum suam centesimam partem.

20. *Eâdem proportione, à primæ columnæ numero secundo, per omnium columnarum secundos: & à tertio, per tertios: & à quarto, per quartos: & à cæteris respectiue, per cæteros fit progressio.*

Vt ex antecedentis columnæ numero aliquo fit numerus eiusdem ordinis in sequenti columnâ, substrahendo suam centesimam partem, numerosque hoc qui sequitur ordine constituendo.

PROPORTIONALIA TERTIÆ TABVLÆ.

Prima Columna.	*Secunda Col.*
10000000.0000	9900000.0000
9995000.0000	9865050.0000
9990002.5000	9890102.4750
9985007.4987	9885157.4237
9980014.9950	9880214.8451
&c. vsq; ad	&c. descendendo ad
9900473.5780	9801468.8423

Tertia Col.	*Inde 4a. 5a &c. vsq. ad 69am columm.*	
9801000.0000	&c. vsque ad	5048858.8900
9796099.5000	&c. vsque ad	5046334.4605
9791201.4503	&c. vsque ad	5043811.2932
9786305.8495	&c. vsque ad	5041289.3879
9781412.6967	&c. vsque ad	5038768.7435
&c. descēdendo ad		vsque tandem ad
9703454.1539	vsque tandem ad	4998609.4034

21. *In tertia ergo Tabula, habes inter ſinum totum, & medium ſinus totius, interiectos ſexaginta octo numeros in proportione vt* 100 *ad* 99; *& rurſus inter ſingulos binos horum, interiectos viginti numeros in proportione vt* 10000 *ad* 9995: *& rurſus inter binos primos horum, ſcilicet inter* 10000000 *&* 9995000, *habes in ſecunda Tabula interiectos* 50 *numeros, in proportione vt* 100000 *ad* 99999: *& tandem inter binos primos horum, habes in prima Tabula interiectos centum numeros, in proportione vt* 10000000 *ſinus totius ad* 9999999; *quorum differentia quum ſit tantum vnitatis, non eſt opus eam (interiectis mediis) minutiùs partiri. Vnde hæ tres tabulæ (poſtquam completæ fuerint) ad tabulam † artificialem computandam ſufficient.*

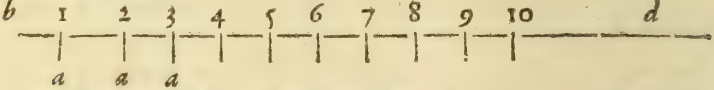
† Logarithm.

Hucuſque ſinus ſeu numeros naturales proportione geometricâ progredientes tabulis facillimè inſerere docuîmus.

22. *Supereſt Tabulæ ſaltem tertiæ, apud ſinus ſiue numeros naturales geometricè decreſcentes, ſuos † numeros artificiales Arithmeticè creſcentes inſerere.*

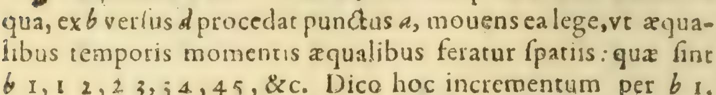
† Logarithm.

23. *Arithmeticè creſcere, eſt æqualibus temporibus æquali ſemper quantitate augeri.*



Vt ex puncto *b* fixo verſus *d*, infinitè producatur linea: in qua, ex *b* verſus *d* procedat punctus *a*, mouens ea lege, vt æqualibus temporis momentis æqualibus feratur ſpatiis: quæ ſint *b* 1, 1 2, 2 3, 3 4, 4 5, &c. Dico hoc incrementum per *b* 1, *b* 2, *b* 3, *b* 4, *b* 5, &c. Arithmeticum dici. In numeris autem ſint *b* 1, 10: *b* 2, 20: *b* 3, 30: *b* 4, 40: *b* 5, 50. Dico 10, 20, 30, 40, 50, &c. Arithmeticè creſcere: quia æqualibus momentis, æquali numero denarij ſemper augeri intelliguntur.

24. *Geometricè decreſcere, eſt æqualibus temporibus quantitatem primò totam, inde aliam atque aliam eius partem ſuperſtitem, ſimili ſemper proportionali parte diminui.*



Vt

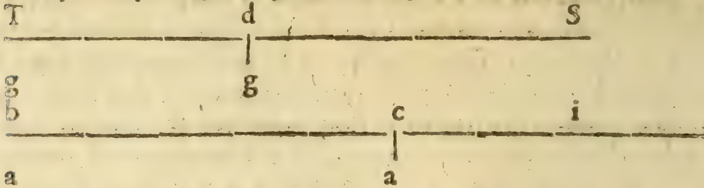
Vt sit linea sinus totius T S, in hac moueatur punctus G, à T in 1 versus S. quantoque tempore defertur à T in 1, quæ sit (exempli gratia) decima pars T S: tanto idem G tempore moueatur ab 1 in 2, quæ sit decima pars 1 S: & à 2 in 3, quæ sit decima pars 2 S: & à 3 in 4, quæ sit decima pars 3 S, & sic de cæteris. Dico hos sinus T S. 1 S, 2 S, 3 S 4 S. &c. dici Geometricè decrescere: quia inæqualibus spatiis proportione similibus & tempore æqualibus diminuuntur. In numeris sit T S, 10000000: 1 S, 9000000: 2 S, 8100000: 3 S, 7290000: 4 S, sit 6561000, &c. Dico hos sinuum numeros, æqualibus temporibus simili proportione diminutos, dici Geometricè decrescere.

Hi quoque numeri sunt continue proportionales.

35. *Vnde punctus mobilis Geometricè ad fixum accedens, velocitates suas prout distantias, à fixo proportionatas habet.*

Vt repetito præcedenti Schemate, dico quum mobilis punctus geometricus G est in T, eius velocitas est vt distantia T S: & quum G est in 1, eius velocitas est vt 1 S: & quum in 2, eius velocitas est vt 2 S, & sic de cæteris. Atque ita quæ est proportio distantiarum T S, 1 S, 2 S, 3 S, 4 S, &c. ad inuicem, ea etiam erit proportio velocitatum G in punctis T, 1, 2, 3, 4, &c. adinuicem. Nam magis minúsve velox punctus arguitur, prout magis minúsve longè sub æqualibus temporibus ferri conspicitur. Qualis itaque processus ratio, talem etiam & velocitatum esse necesse est: at talis est sub æqualibus temporibus ratio processuum T 1, 1 2, 2 3, 3 4, 4 5, &c. qualis distantiarum T S, 1 S, 2 S, 3 S, 4 S, &c. vt mox docebimus. Vnde necessariò qualis habitudo distantiarum G ab S, videlicet T S, 1 S, 2 S, 3 S, 4 S, &c. inuicem; talis etiam est velocitatum G in punctis T, 1, 2, 3, 4, &c. quod erat demonstrandum. At quòd processuum T 1, 1 2, 2 3, 3 4, 4 5, &c. talis sit ratio, qualis distantiarum T S, 1 S, 2 S, 3 S, 4 S, &c. patet: quia quantitatum proportionaliter continuatarum differentiæ etiam in eadem proportione continuantur. At hæ distantiæ (per hypothesim) proportionaliter continuantur, & illi processus sunt harum differentiæ: quare eadem processus qua distantias ratione continuari certum est.

26. † *Numerus artificialis sinus dati est, qui Arithmeticè crevit tantâ semper velocitate, quantâ sinus totus incepit Geometricè decrescere: tantoque tempore, quanto sinus totus in sinum illum datum decrevit.*



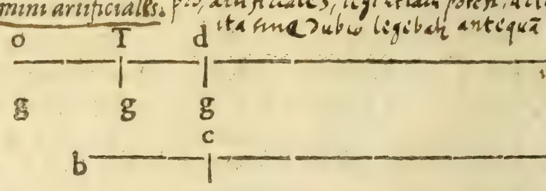
Sit sinus totus linea T S, sinus datus in eadem linea d S: certis quibusdam momentis moveatur g Geometricè à T in d. Sitque alia linea b i versus i infinita, in qua ex b moveatur a Arithmeticè, eâdem velocitate quâ g primò cùm erat in T: totidemque temporis momentis procedat a ex b fixo versus i usque in c punctum: dicetur numerus metiens b c lineam numerus artificialis sinus d S dati.

27. *Vnde sinus totius nihil est pro artificiali.*

Nam ex Schemate, cùm g est in T faciens suam distantiam ab S sinum totum, punctus Arithmeticus a incipiens in b, nusquam inde processit. Vnde ex definitione distantiæ, sinus totius nullus erit artificialis.

28. *Hinc etiam sequitur, quod cujuslibet dati sinus numerus artificialis, major est differentia inter sinum totum, & sinum datum: & minor differentia quæ est inter sinum totum, & quantitatem eo majorem in eadem ratione, qua est sinus totius ad datum. Atque hæ differentiæ dicuntur ideò termini artificiales.*

Vt repetito præcedenti Shemate, protractâq; lineâ S T vltra T in o, Ita ut S o se habeat ad T S, ut T S ad d S. Dico sinus d S numerum artificialem b c, majorem esse quàm T d, & minorem quàm o T. Quanto enim tempore g ab o in T fertur, tanto & g à T in d feretur (per 24) quia o T est tanta pars o S, quanta T d est lineæ T S, tantoque tempore (per definitioné artificialis) feretu



[Marginal handwritten notes: "quám"; "Sinus totus est T S / Sinus datus d S / quantitas sinu toto major in ea ratione, q̄ ē sinus totius ad datum, ē o S"; "pro artificiales, legi etiam potest artificiali ita sine dubio legebatur antequā a me ... illata e"]

feretur & a à b in c: Ita ut o T, T d, & b c sint æqualium temporum processus. At quia g inter T & o mouens, velocior est quàm in T, & inter T & d tardior, in T autem, g æqui velox est atque a (per 26) Sequetur processum o T quem g iam velox facit, maiorem esse: & T d processum quem g tardus facit, minorem esse: & b c processum (quem punctus a mediocri suo motu totidem etiam temporis momentis peragit) medium quoddam esse inter vtrumque, quod erat demonstrandum. Numeri itaque artificialis quem b c designat, dicitur o T terminus maior, & T d terminus minor.

29. *Dati itaque sinus artificiales terminos exhibere.*

Ex præmissa probatur minorem terminum relinqui, ablato sinu dato à sinu toto; & maiorem terminum produci, multiplicato sinu toto in terminum minorem, & producto diuiso per sinum datum, vt sequenti exemplo.

30. *Vnde primæ Tabulæ primum proportionale, quod est 9999999, habet suum artificialem numerum inter terminos* 1.0000001, *&* 1.0000000.

Nam per præmissam aufer 9999999 à sinu toto cyphris aucto fiet unitas cum suis cyphris pro minore termino: hanc vnitatem cyphris auctam, & multiplicatam in sinum totum, diuide per 9999999, & fient 1 0000001; siue (si majorem accurationem requiris) 1.00000010000001 pro majore termino.

31. *Insensibili differentia distantes termini ipsi, siue inter eos quiduis pro numero artificiali vero habetur.*

Vt in superiori exemplo, sinus hujus 9999999. artificialis numerus habetur hic 1.0000000, siue hic 1.00000010, siue omnium optimè hic 1.0000005: quia enim ipsi termini 1.0000001 & 1.0000000, insensibili fractione vtpote $\frac{1}{10000000}$ differunt ab inuicem: ideò & ipsi, & quicquid inter eos est, multò minùs, multóque insensibiliore errore, à vero different artificiali inter hos terminos constituto.

32. *Quæcunque sinuum Geometrica proportione à sinu toto deficientium, vnius artificiali numero aut terminis datis, cæterorum etiam dare.*

Consequitur hoc necessariò incrementi Arithmetici, decrementi

(Handwritten in margin: proporcionales, hic commode legitur artificialis / quod remanet ablato sinu dato à sinu toto est minimus terminus artificialis)

menti Geometrici, & numeri artificialis definitiones: siquidem per illas, vt sinus Geometrica proportione decrescunt continuò: ita interim sui artificiales, continuo Arithmetico progressu per æqualia accrescunt. Vnde cuilibet sinui Geometricæ progressionis decrescendo, respondet suus artificialis Arithmeticæ progressionis crescendo: primo scilicet primus, & secundo secundus, & sic deinceps.

Ita vt si primus artificialis, respondens primo sinui post sinum totum detur, secundus artificialis erit eius duplum, tertius triplum, & sic de cæteris: donec omnes omnium artificiales innotescant, vt sequenti exemplo patebit.

33. *Hinc omnium sinuum proportionalium primæ Tabulæ, numeri artificiales inter terminos propinquos includi, & per consequens exactè satis dari possunt.*

Vt cùm sinus totius artificialis sit 0 (per 27) & primi post sinum totum, qui est *9999999* in prima Tabula, artificialis sit (per 30) inter terminos 1.0000001, & 1.0000000: necessariò secundi post sinum totum, qui est *9999998*.0000001, artificialis continebitur inter dupla illorum terminorum: scilicet inter 2.0000002 & 2.0000000: & tertij *9999997*.0000003, inter eorundem tripla: scilicet inter 3.0000003 & 3.0000000. Et sic in cæteris, æqualiter semper augendo terminos interuallo primorum terminorum: donec omnium proportionalium primæ Tabulæ artificiales terminos compleueris. Poteris consimili progressu, si libet, numeros ipsos artificiales exiguo & insensibili errore continuare hoc ordine: pro sinus totius artificiali, erit 0: pro primi post sinum totum artificiali, erit 1.00000005 (per 31:) pro secundi, 2.00000010: pro tertij, 3.00000015. Et ita deinceps.

34. *Differentia artificialium sinus totius & sinus dati, est ipsius dati artificialis.*

Patet hoc, quum enim sinus totius artificialis sit nihil per 27, hoc nihilo ex artificiali dati subducto, ipsum integrum artificialem dati remanere necesse est.

35. *Duorum artificialium differentia, addenda est ad artificialem maioris sinus eorundem, vt habeas artificialem minoris: & substrahenda ab artificiali minoris sinus, vt habeas artificialem maioris.*

Neces-

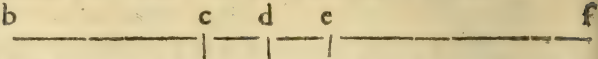
Necessariò hoc fit, siquidem crescunt artificiales decrescentibus sinibus, atque minor est artificialis maioris sinus, & maior minoris. Ideóque æquum est differentiam addere minori artificiali, vt habeas artificialem maiorem licet minoris sinus: & contrà, auferre differentiam à maiore artificiali, vt habeas minorem artificialem licet maioris sinus.

36. *Similiter proportionatorum sinuum sunt æqui-differentes artificiales.*

Consequitur hoc necessariò definitiones artificialium & motuum: Nam cùm per eas, Geometrico decremento similiter proportionato, respondet Arithmeticum incrementum æquale semper: necessariò similiter proportionatis sinibus, respondere æqui-differentes artificiales & numeros, & numerorum terminos concludimus. Vt in superiori exemplo primæ Tabulæ, quia similis est proportio inter primum proportionale post sinum totum *9999999*.0000000, & tertium *9999997*. 0000003 : ei quæ est inter quartum *9999996*. 0000006, & sextum *9999994*. 0000015. Ideò numerus artificialis iste 1. 0000005 primi, differt ab artificiali isto 3. 0000015 tertij, eadem differentia, qua artificialis iste 4. 00000020 quarti, differt ab artificiali isto *6*.00000030 sexti proportionalis. Eadem etiam est æqualitatis ratio inter differentias terminorum artificialium adinuicem : videlicet tam minorum inter se, quàm etiam maiorum inter se, quorum sinus sunt similiter proportionati.

37. *Vt trium sinuum in proportione Geometrica continuatorum, quadratum medij æquatur facto ex ductis inuicem extremis: Ita in suis artificialibus numeris, duplum medii æquatur aggregato extremorum. Vnde horum artificialium duobus quibuscunque datis, tertius innotescit.*

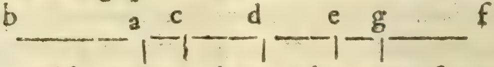
Quia horum trium sinuum, ratio quæ est inter primum & secundum, similis est rationi quæ est inter secundum & tertium : Ideò (per præmissam) suorum artificialium ea est differentia inter primum & secundum, quæ est inter secundum & tertium. Sit (verbi gratia) primus artificialis linea b c expressus, secundus linea b d, tertius linea b e: sintque vnica linea b c d e comprehensi hoc modo



ſint que differentiæ c d & d e æquales; horum medium b d dupletur, productâ linea hâc à b vltra e in f, ita ut b f ſit duplum b d. Dico b f æquari utriſque lineis, b c primi artificialis, & b e tertij: ab æqualibus enim b d & d f, aufer æqualia c d & d e: ſcilicet c d, à b d, & d e, à d f: & remanebunt b c & e f neceſſariò æqualia. Cùm itaque tota b f, æqualis ſit vtriſque b e & e f: ergo & vtriſque b e & b c æquabitur, quod erat demonſtrandum. Vnde ſequitur canon: ſi trium horum artificialium medium datum duplaueris, & hinc ſubſtraxeris extremum datum, reliquum extremorum quæſitum innoteſcet: & ſi extrema data conjunxeris, & aggregatum hoc bipartiueris, medium fiet notum.

38. *Quatuor Geometricè proportionalium, ſicut factum ex ductu mediorum, æquatur facta ex ductu extremorum: Ita ſuorum artificialium, aggregatum mediorum æquatur aggregato extremorum. Vnde horum artificialium tribus quibuſcunque datis, quorum innoteſcit.*

Quia horum quatuor proportionalium, ratio quæ eſt inter primum & ſecundum, ſimilis eſt rationi quæ eſt inter tertium & quartum: Ideò (per penultimè præmiſſam) ſuorum artificialium, ea eſt differentia inter primum & ſecundum, quæ eſt inter tertium & quartum. Tales itaque quantitates in linea b f ſupraſcripta ſumantur, vt hic, quarum b a primum artificialem, b c ſecundum, b e tertium, & b g quartum referat, factis differentiis.



a c & e g æqualibus: Ita ut d in medio c e poſitum, in medio a g etiam poni neceſſe eſt. Iam dico aggregatum b c ſecundi, & b e tertij, æquari aggregato b a primi, & b g quarti. Nam quia (per præmiſſam) duplum b d, quod eſt b f, æquatur vtrique b c & b e: quia differentiæ eorum à b d, videlicet c d & d e ſunt æquales. Eâdem ratione, & idem b f æquabitur vtriſque b a & b g: quia eorũ differentiæ à b d, videlicet a d & d g ſunt etiam æquales.

Quum

Quum itaque & aggregatum ex b a & b g, & aggregatum ex ex b c & b e, sint iidem duplo b d, quod est b f æqualia: ergò & inter se æquabuntur, quod erat demonstrandum. Vnde sequitur canon, si quatuor horũ artificialium, ab aggregato extremorum datorum, subduxeris alterum mediorum cognitũ, relinquetur reliquum medium quod quærebatur: & si ab aggregato mediorum cognitorum subduxeris alterum extretremorum cognitum, relinquetur extremum quæsitum.

39. *Duorum artificialium differentia, est inter duos terminos, ad quorum maiorem se habet sinus totus, vt eorum artificialium minor sinus ad sinuum differentiam: & ad minorem terminum se habet sinus totus, vt artificialium sinus maior ad sinuum differentiam.*



Sit sinus totus T S, sinus duo dati d S major, & e S minor: Vltra S T signetur puncto V distantia T V, ea lege, ut S T se habeat ad T V, ut e S minor sinus, ad d e differentiam sinuum. Deinde citra T versus S, signetur puncto c distantia T c ea lege, vt T S se habeat ad T c, vt d s sinus major, ad d e diffentiam sinuum. Dico differentiam artificialium respondentium sinibus d S & e S, constitui inter terminos V T majorem, & T c minorem. Nam quia ex hypothesi, vt e S ad d e, ita T S ad T V; & vt d S ad d e, ita T S ad T c se habent: ideò etiam ex natura (proportionalium) sequuntur duæ conclusiones: Primò, quod V S se habet ad T S, vt idem T. ad c S. Secundò, quod similis est ratio T S ad c S, rationi quæ est d S ad e S. Et propterea (per 36) differẽtia artificialium respondentium sinibus d S & e S, æqualis est differentiæ artificialiũ respondentium sinui toto T S, & sinui c S. At hæc differentia (per 34) est artificialis ipsius sinus c S: & hic artificialis inter terminos V T majorem, & T c minorem (per 28 pos.) inclũditur: quia per primam conclusionem jam dictam, V s major sinu toto se habet ad sinum totum T s, vt idem T s ad c S. Vnde necessariò differentia artificialium respondentium sinibus d S & e S, constituitur inter terminos V T majorem, & T c minorem, quod erat demonstrandum.

40. *Terminos differentiæ inter artificiales numeros duorum datorum sinuum exhibere.*

Quum per præmissam, sinus minor se habeat ad differentiam sinuum, vt sinus totus ad maiorem terminum differentiæ artificialium: & sinus maior se habeat ad differentiam sinuum, vt sinus totus ad minorem terminum: sequetur ex natura proportionalium, quod ducto sinu toto per differentiam datorum sinuum, orietur ex producto diuiso per minorem datorum, maior terminus: & ex producto diuiso per maiorem sinuum, orietur minor terminus.

EXEMPLVM.

VT sit sinuum datorum maior *999997*5. 5000000, minor autem *999997*5. 0000300: quorum differentiâ. *49997*00 ductâ in sinum totum (adiectis priùs octo cyphris vtrique post punctum demonstrationis gratiâ, licet alioquin septem sufficiant) quod hinc producitur, si per maiorem sinum, scilicet per *999997*5. 5000000 diuiseris, prouenient. *49997*122 octo figurarum post punctum pro minore termino. Sin quod producitur, per minorem sinum, scilicet per *999997*5. 0000300 diuiseris, prouenient. *49997*124 pro maiore termino: inter quos (vt demonstratum est) constituitur differentia artificialium sinuum datorum. Sed quia protractio huius fractionis in octauam figuram vltra punctum, est accuratio plusquam requisita, præsertim cùm in ipsis sinibus septem tantum ponantur figuræ post punctum: ideò deletâ octauâ illâ siue vltimâ vtriusque termini figurâ vterque terminus vnà cum ipsâ artificialium differentia, in fractione. *49997*12 stabiliri potest, absque vel minimo scrupulo sensibilis erroris.

41. *Sinuum vel numerorum naturalium, non in ipsos proportionales primæ Tabulæ, sed prope vel inter eos cadentium: numeros artificiales, eorúmve saltem terminos insensibili differentia distantes exhibere.*

Sinui dato sinum primæ Tabulæ proximum, siue minorem siue maiorem nota: huius tabulati sinus terminos artificiales (per 33) quære, & inuentos reserua: deinde (per præmissam) terminos differentiæ inter artificiales numeros sinus

dati

dati & ſinus tabulati, ſiue ambos, ſiue (quia ferè æquales ſunt, vt ſuperiori exemplo patet) eorum alterutrum quære. Hos iam inuentos, horúmve alterutrum adde ad illos nuper reſeruatos terminos, aut ab illis ſubſtrahe (per 8. 10 & 35. prout ſinus datus fuerit minor aut maior tabulato ei proximo: & qui hinc producuntur numeri, erunt termini propinqui inter quos includetur artificialis numerus ſinus dati.

EXEMPLVM.

VT ſit ſinus datus *9999975*. 5000000, cui ſinus in Tabula proximus, eſt *9999975*. 0000300 minor dato: huius termini artificiales (per 33) ſunt 25. 00000025 & 25. 0000000: deinde (per præmiſſam) differentia inter artificiales numeros ſinuum dati & tabulati, eſt. 4999712: quam (per 35) aufer ab illis terminis, quia ſunt termini minoris ſinus, & prouenient 24. 5000313 & 24. 5000288, termini quæſiti ſinus dati 9999975 5000000: cuius ipſe artificialis numerus in quouis terminorum, ſiue optimè in 24. 5000300 (per 31) conſtitui poteſt abſque ſenſibili errore.

ALIVD EXEMPLVM.

SIT ſinus datus *9999900*. 0000000, ſinus tabulatus ei proximus *9999900*. 0004950, huius termini artificiales ſunt 100.0000100 & 100.0000000 (per 33:) Deinde differentia inter artificiales numeros illorum ſinuum, erit (per præmiſſam). 0004950, quam (per 35) ad ſuperiores terminos adde, & fient 100.0005050 pro maiore termino, & 100. 0004950 pro minore termino, inter quos artificialis quæſitus ſinus dati includitur.

42. *Hinc ſequitur, omnium proportionalium ſecundæ Tabulæ numeros artificiales exactè ſatis dari: ſeu inter terminos cognitos inſenſibili fractione differentes includi poſſe.*

Vt in præcedenti exemplo, quum numerus artificialis huius ſinus *9999900* (qui eſt primum proportionale ſecundæ Tabulæ) demonſtretur inter terminos hos 100. 0005050 & 100. 0004950 eſſe: neceſſariò ſecundi proportionalis, numerus artificialis (per 32) erit inter hos terminos 200 0010100 & 200. 0009900: & tertij proportionalis, inter hos terminos 300.0015150 & 300. 0014850, &c. Et tandem

vltimi ſinus ſecundæ Tabulæ, qui eſt 9995001. 222927, artificialis numerus includetur inter terminos hos 5000. 0252500 & 5000. 0247500. Quibus iam habitis terminis (per 31) poteris ipſos artificiales numeros eorum exquirere.

43. *Sinuum vel numerorum naturalium non in ipſos proportionales ſecundæ Tabulæ, ſed prope vel inter eos cadentium, numeros artificiales exhibere: ſeu inter terminos cognitos inſenſibili fractione differentes includere.*

Sinui dato ſinum ſecundæ Tabulæ proximum, ſiue maiorem ſiue minorem nota, huius tabulati ſinus terminos artificiales per præmiſſam quære: deinde per regulam proportionis, quære quartum proportionale ſe habens ad ſinum totum: vt ſinuum dati & tabulati minor ſe habet ad maiorem. Quod vno modo perfici poterit, ducendo dati & tabulati minorem in ſinum totum, & productum in maiorem diuidendo. Altero modo faciliore, ducendo ſinuum dati & tabulati differentiam in ſinum totum, & productum in dati & tabulati maiorem diuidendo, atque quotientem ex ſinu toto auferendo. At quia huius quarti proportionalis, numerus artificialis (per 36) tantum differt ab artificiali ſinus totius, quantum inuicem artificiales ſinuum dati & tabulati differunt: Et quia etiam illorum differentia, eadem eſt cum ipſo artificiali quarti per 34: Ideò artificiales terminos quarti, per penultimè præmiſſam è Tabula prima quære, & inuentos adde ad artificiales terminos tabulati, aut ab illis ſubſtrahe per 8. 10. & 35. prout tabulatus ſinus fuerit maior aut minor dato, & producentur artificiales termini ſinus dati.

EXEMPLVM.

VT ſit ſinus datus 9995000. 000000, ſinus Tabulæ ſecundæ ei proximus eſt 9995001.222927, huius termini artificiales (per præmiſſam) ſunt 5000. 0252500 & 5000. 0247500. Quartum deinde proportionale alterutro modorum ſuprascriptorum quære, & fiet 9999998.7764614, cuius terminos artificiales (per 41) è prima Tabula quære, eruntque 1. 2235387 & 1. 2235386: quos ad ſuperiores terminos per 8 & 35 adde, fientque pro terminis artificialibus dati 5001. 2487888 & 5001. 2482886. Vnde & numerus inter

hos

hos medius, qui est 5001.2485387, optimè (per 31 pos.) pro ipso artificiali numero sinus 9995000 dati statuitur absque sensibili errore.

44. *Hinc sequitur, omnium proportionalium primæ Columnæ tertiæ Tabulæ, numeros artificiales exactè satis dari: seu inter terminos cognitos insensibili fractione differentes includi posse.*

Nam quum per præmissam, huius 9995000 (qui est primus sinus infra sinum totum, ex proportionalibus primæ Columnæ tertiæ Tabulæ) numerus artificialis sit 5001.2485387 absque errore sensibili: secundi proportionalis scilicet 9990002.5000, numerus artificialis (per 32) erit 10002.4970774. Et sic in cæteris, progrediendo vsque ad vltimum eius columnæ sinum 9900473.57808. cuius, pari ratione artificialis numerus erit 100024.9707740: eiusque termini 100024.9657720 & 100024.9757760 erunt.

45. *Numerorum naturalium, seu sinuum non in ipsos proportionales primæ Columnæ tertiæ Tabulæ, sed prope vel inter eos cadentium, numeros artificiales exhibere: seu inter cognitos terminos insensibili fractione differentes includere.*

Sinui dato sinum primæ Columnæ tertiæ Tabulæ proximum, siue minorem siue maiorem nota; huius tabulati terminos artificiales per præmissam quære: deinde quartum proportionale se habens ad sinum totum, vt sinuum dati & tabulati minor ad maiorem, per vnum ex modis in penultimè præcedente descriptis quære: huius quarti ita inuenti terminos artificiales (per penultimè præmissam) è secunda Tabula quære, & inuentos adde ad terminos tabulati sinus superiùs inuentos, aut ab illis substrahe (per 8. 10. & 35.) & producentur artificiales termini sinus dati.

EXEMPLVM.

VT sit sinus datus 9900000, proportionalis sinus primæ Columnæ tertiæ Tabulæ ei proximus, est 9900473.57808, cuius termini artificiales per præmissa sunt 100024.9657720 & 100024 9757760. Quartum inde proportionale erit 9999521.6611850, cuius termini artificiales (per 43 è secunda Tabula desumpti) sunt 478.3502290 & 478.3502812: quibus terminis ad terminos superiores tabulati

(per

(per 8 & 35) additis, prouenient termini 100503.3260572 & 100503.3160010, inter quos necessariò cadit artificialis numerus quæsitus. Vnde numerus inter hos medius, qui est 100503. 3210291, pro vero artificiali numero sinus 9900000 dati, statui absque sensibili errore potest.

46. *Hinc sequitur, omnium proportionalium tertiæ Tabulæ numeros artificiales exactè satis dari.*

Nam quum (per præmissam) 100503. 3210291, sit artificialis primi sinus secundæ Columnæ, qui est 9900000, cæterique primi reliquarum columnarum sinus eadem proportione progrediantur, necessariò (per 32 & 36) eorum numeri artificiales eadem semper differentia crescunt, additis 100503. 3210291 antecedenti artificiali, vt fiat sequens. Habitis ergo sic primis artificialibus cuiusque columnæ, atque per penultimè præcedentem omnibus artificialibus primæ columnæ datis, elige tibi, an mauis simul eiusdem columnæ omnes artificiales condere, addendo semper ad superiorem artificialem cuiuslibet columnæ, hanc artificialium differentiam 5001. 2485387, vt fiat proximè inferior eiusdem columnæ artificialis: An mauis simul eiusdem ordinis omnes artificiales, scilicet omnes secundos singularum columnarum artificiales, inde omnes tertios, inde quartos, & sic reliquos constituere, addendo semper 100503. 3210291 cuilibet artificiali præcedentis columnæ, vt eiusdem ordinis sequentis columnæ artificialis proueniat. Vtrouis enim modo, omnes omnium huius Tabulæ proportionalium habentur artificiales, quorum vltimus, & ad sinum 4998609. 4034 congruens, est 6934250. 8007528.

47. *Omnibus tertiæ Tabulæ naturalibus numeris, ascribendi sunt sui artificiales, vt tertia Tabula integra fiat & perfecta: quam posthac semper radicalem vocabimus.*

Hæc huius Tabulæ conscriptio fit constituendo columnas numero & ordine quibus per 20 & 21 describuntur: & diuisâ in duas series:

Radicalis Tabulæ.

Columna prima.		*Columna ſecunda.*	
Naturales.	Artificiales	Naturales.	Artificiales
10000000.0000	0	9900000.0000	100503.3
9995000.0000	5001.2	9895050.0000	105504.6
9990002.5000	10002.5	9890102.4750	110505.8
9985007.4987	15003.7	9885157.4237	115507.1
9980014.9950	20005.0	9880214.8451	120508.3
&c.uſque ad	uſque ad	uſque ad	uſque ad
9900473.5780	100025.0	9801468.8423	200528.2

& cæteri vſque ad

Columna 69.	
Naturales.	Artificiales.
5048858.8900	6834225.8
5046333.4605	6839227.1
5043811.2932	6844228.3
5041289.3879	6849229.6
3038768.7435	6854230.8
& tandem	uſque ad
4998609.4034	6934250.8

quarum prima, proportionalia illa Geometrica, quæ ſinus numeroſque naturales nominamus: ſecunda, hos ſuos artificiales Arithmeticè per æqualia progredientes

contineat. Duobus tamen (compendij, gratiâ) animaduersis: Primò quòd illis omnibus artificialibus, vnam post punctum relinqui figuram satis sit, cæteris sex nouissimis jam rejectis; quas tamen si initio neglexisses error inde frequenti multiplicatione priorum tabularum, accreuisset in hac tertia intollerabilis. Secundò, si secunda post punctum figura excedat quaternarium: figura prima, quæ sola post punctum relinquitur, est vnitate augenda. Vt pro 10002. 48, &c. rectius est ponere 10002.5, quàm 10002.4: & pro 100035001, aptiùs ponimus 1000.4, quàm 1000.3. Itaque eo situ procedat jam radicalis Tabula quo præmittitur.

48. *Perfecta iam radicali Tabula, ex ea sola* Tabulæ *artificialis numeros excerpimus.*

Vt enim priores duæ Tabulæ ad constitutionem tertiæ in inseruiebant; Ita tertia hæc radicalis ad principalem artificialem Tabulam, quàm facillimè & absque errore sensibili condendam inseruit.

49. *Sinuum majorum quàm 999700, artificiales numeros facillimè exhibere.*

Fiet hoc, sola substractione sinus dati à sinu toto. Nam per 29, artificialis numerus sinus 9996700, est inter terminos 3300 & 3301; qui quidem termini (quia inuicem vnitate tantum differunt) à suo artificiali vero, non possunt errore sensibili, videlicet majore vnitate differre. Vnde ipse terminus minor 3300, qui sola substractione habetur, pro ipso artificiali capi potest. Eadem necessariò ratio est de omnibus sinibus hoc majoribus.

50. *Sinuum omnium intra limites* Tabulæ *radicalis comprehensorum, artificiales exhibere.*

Sinuum dati, & tabulati ei proximi, differentiam duc in sinum totum, productum partire per facillimum diuisorem, qui vel sit sinus datus, vel tabulatus ex proximis, vel inter vtrumque vtcunque constitutus; & producetur differentiæ artificialium aut terminus major, aut minor, aut intermedium quidpiam (per 39) quorum nullus à vera artificialiũ differentia errore sensibili differet, propter propinquitatem numerorum Tabulæ. Et ideò hunc eorum quemcunque productum

ductum (per 35) adde, ad artificialem tabulati in Tabula repertum, si sinus datus sit minor tabulato sinu: alioquin illum productum ex hoc tabulati artificiali substrahe, & prouenies dati sinus numerus artificialis quæsitus.

EXEMPLVM.

VT, sit sinus datus 7489557, cuius quæritur artificialis. Sinus tabulatus ei proximus est 7490786. 6119, hinc aufero illam adiectis cyphris sic 7489557.0000, relinquentur 1229 6119; quæ ducta in sinum totum, diuido per numerum facillimum, qui sit vel 7489557.0000, vel 7490786. 6119, vel optimè per quippiam inter eos constitutum, vt pote per 7490000, & facillima diuisione prouenient 16401: quæ (quia datus sinus minor est tabulato) adde ad artificialem tabulati, videlicet ad 2889111.7, & fient 2890751.8, quæ idem valent quod $2890751\frac{4}{5}$: sed quia Tabula principalis nec fractiones admittit, nec quicquam vltra punctum, ponimus pro illo 2890752, qui est artificialis quæsitus.

ALIVD EXEMPLVM.

SIt sinus datus 7071068. 0000, sinus tabulæ ei proximus erit 7070084.4434, quorum differentia est 983566, quibus ductis in sinum totum, productum diuide optimè per 7071000, quæ sunt inter sinus datum & tabulatum, prouenient inde 1390.9: quæ (quia sinus datus excedit tabulatum ei proximum) substrahatur ex artificiali numero tabulati in tabula reperto, scilicet à 3467125. 4, remanebit 3465734. 5. Vnde 3465735 ponitur pro artificiali quæsito sinus 7071068 dati. Itaque hæc libertas diuisorem eligendi miram parit facilitatem.

51. *Omnes sinus in proportione dupla, habent 6931469 22 pro differentia suorum artificialium.*

Quia enim omnis sinus ad suum dimidium eadem est ratio, quæ est sinus totius ad 5000000: ideò (per 36) diffe-

rentia artificialium cuiuſque ſinus & ſui dimidij, eſt eadem cum differentia artificialium ſinus totius, & ſui dimidij 5000000. At eadem eſt differentia artificialium ſinus totius, & ſinus 5000000, cum ipſo artificiali ſinus 5000000 (per 34) cuius 5000000, artificialis (per præmiſſam) erit 6931469.22. Ergo & idem numerus 6931469.22 erit differentia omnium artificialium, quorum ſinus ſunt in proportione dupla: & per conſequens duplum eius, ſcilicet 13862938.44, erit differentia omnium artificialium, quorum ſinus ſunt in ratione quadrupla: & triplum eius, videlicet 20794407.66, erit differentia omnium artificialium, quorum ſinus ſunt in ratione octupla.

52. *Omnes ſinus in proportione decupla, habent* 23025842. 34 *pro differentia ſuorum artificialium.*

Nam per penultimè præmiſſam, ſinus 8000000 habet artificialem ſuum 2231434.68: & per præmiſſam, differentia inter artificiales ſinuum 8000000, & ſuæ octauæ partis 1000000, eſt 20794407 66: Vnde per additionem fiunt 23025842.34, pro artificiali ſinus 1000000: & quum ad hunc ſinus totus ſit decuplus, omnes ſinus in ratione decupla, eandem illam differentiam 23025842. 34, inter ſuos artificiales habebunt, eâdem cauſâ & ratione, quam iam in dupla proportione per præcedentem expoſuimus, quod probandum erat. Et per conſequens, centuplæ proportioni reſpondebit huius artificialis duplum, quod eſt 46051684.68, pro differentia artificialium: Et eiuſdem triplum, quod eſt 69077527.02, erit differentia omnium artificialium, quorum ſinus ſunt in ratione millecupla. Et ſic de ratione 10000ª, & aliis, vt infrà.

53. *Vnde omnes ſinus in ratione compoſita ex duplo & decuplo, habent artificiales ſuos differentiâ* 6931469.22, *& differentiâ* 23025842. 34 *reſpectiuè differentes.*

Vt in tabella ſubſequenti conſpicere licet.

Sinuum

Sinuum proportiones datæ.	Artificialium respondentes differentiæ.	Sinuum proportiones datæ.	Artificialium respondentes differentiæ.
Dupla	6931469.22	8000^{pla}	89871934.68
Quadrupla	13862938.44	10000^{pla}	92103369.36
Octupla	20794407.66	20000^{pla}	99034838.58
Decupla	23025842.34	40000^{pla}	105966307.80
20^{cupla}	29957311.56	80000^{pla}	112897777.02
40^{cupla}	36888780.78	100000^{pla}	115129211.70
80^{cupla}	43820250.00	200000^{pla}	122060680.92
Centupla	46051684.68	400000^{pla}	128992150.14
200^{pla}	52983153.90	800000^{pla}	135923659.36
400^{pla}	59914623.12	1000000^{pla}	138155054.04
800^{pla}	66846092.34	2000000^{pla}	145086523.26
Millecupla	69077527.02	4000000^{pla}	152017992.48
2000^{pla}	76008996.24	8000000^{pla}	158949461.70
4000^{pla}	82940465.46	10000000^{pla}	161180896.38

54. *Omnium sinuum vltra limites radicalis Tabulæ exclusorum, numeros artificiales inuestigare.*

Hoc facilè fit, sinum datum multiplicando per 2, 4, 8, 10, 20, 40, 80, 100, 200: vel per alium quemuis proportionis numerum hac tabella expressum, donec producatur numerus qui intra limites radicalis tabulæ contineatur. Huius iam sub Tabula comprehensi artificialem (per 50) quære, cui acquisito adde tandem differentiam artificialem, quam Tabella indicat priori conuenisse multiplicationi.

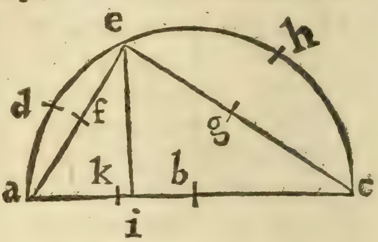
EXEMPLVM.

QVæritur, quem artificialem sinus 378064 habeat; is cùm vltra limites Tabulæ radicalis excludatur, per numerum aliquem proportionum præcedentis tabellæ, vtpote per

20 ducatur, fietque 7561280, cuius iam intra Tabulam cadentis artificialem (per 50) quære, fiétque 2796444. 9, ad quem adde differentiam in Tabella inuentam conuenientem vigecuplæ proportioni, quæ est 29957311.56, fiéntque 32752756.4. Vnde 32752756 est artificialis quæsitus, sinus 378064 dati.

55. *Vt dimidium sinus totius, se habet ad sinum dimidij alicuius arcus; Ita sinus complementi eiusdem dimidii, ad sinum totius arcus.* arcus

Sit sinus totus a b, dupletur & sit a b c; hac diametro fiat semi-circulus, in quo signetur arcus ille a e, bifariam in d diuisus: eius ergo dimidij quod est d e, extendatur complementum ab e versus c, quod sit arcus e h, cui & h c necessariò æquatur: quia d e h quadrans æquatur reliquo quadranti arcuum a d & h c. Proinde ducantur linea e i perpendicularis ad a i c, quæ ideò sinus est arcus a d e: & linea a e, cuius dimidium

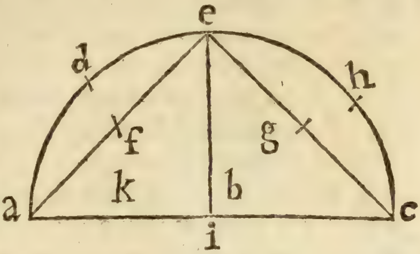


f e, est sinus arcus d e, qui est dimidium arcus a d e: & linea e c, cuius dimidium e g est sinus arcus e h, & ideò est sinus complementi arcus d e: dimidium autem sinus totius a b sit a k. Dico vt a k se habet ad e f, ita e g ad e i se habebit: duo enim trianguli c e a, & c i e, æqui-anguli sunt: quia i c e, vel a c e angulus vtrique communis est, & vterque c i e, & c e a rectus est, ille ex hypothesi, hic, quia in peripheria est, & semi-circulum occupat. Ideóque vt a c hypotenusa trianguli c e a, ad eius minus latus a e; ita se habet c e hypotenusa triang. c i e, ad eius minus latus e i. Et quum totum a c se habeat ad a e, vt totum e c ad e i: sequetur inde dimidium a c, quod est a b, se habere ad a e, vt dimidium e c, quod est e g, se habet ad e i. Et denique cùm iam totum a b est ad totum a e, vt e g ad e i: Concludimus necessariò dimidium a b, quod est a k, se habere ad dimidium a e, quod est f e: vt e g se habet ad

e i, quod erat demonſtrandum.

56. *Duplum artificialis arcus 45 graduum, eſt artificialis dimidij ſinus totius.*

Repetito præcedenti Schemate ſit caſus talis, quòd a e, & e c, ſint æquales. In hoc caſu cadet i in b, eritque e i ſinus totus, atque e f, & e g æquabuntur: eorumque quiuis ſinus eſt 45 graduum. Et quia (per præcedentem) quæ eſt proportio dimidij ſinus totius a k, ad e f ſinum 45 graduum: ea eſt etiam proportio e g ſinus quoque 45 graduum, ad e i iam ſinum totum.



Ideò (per 37) duplum artificialis ſinus 45 graduum, æquale eſt artificialibus extremorum, ſcilicet ſinus totius, & eius dimidij. At horum amborum artificiales, ſunt tantum artificialis alterius eorum, ſcilicet dimidij ſinus totius: quia reliqui ſcilicet ipſius ſinus totius (per 27) artificialis nullus eſt. Neceſſariò igitur duplum artificialis arcus 45 graduum, eſt artificialis dimidij ſinus totius, quod erat demonſtrandum.

57. *Aggregatum ex artificiali dimidii ſinus totius, & artificiali cuiuſque arcus, æquatur aggregato artificialium dimidii eius arcus, & complementi huius dimidii. Vnde artificialis huius dimidii arcus haberi poteſt, cæterorum trium artificialibus datis.*

Quia per penultimè præmiſſam, dimidium ſinus totius proportionatur ad ſinum dimidij alicuius arcus, vt ſinus complementi eiuſdem dimidii arcus, ad ſinum totius arcus: Ideò (per 38) aggregatum artificialium duorum extremorum, ſcilicet artificialis dimidij ſinus totius, & artificialis cuiuſuis totalis arcus, æquabitur aggregato artificialium mediorum, videlicet artificialis dimidij eiuſdem arcus, & artificialis complementi huius dimidij. Vnde & per eandem 38, ſi addideris artificialem dimidij ſinus totius (per 51, vel per præmiſſam inuentum) ad artificialem cuiuſuis totalis

arcus

arcus datum : & hinc ſubſtraxeris artificialem complementi dimidij prioris arcus datum, relinquetur ipſe artificialis petitus eiuſdem dimidij arcus : quæ erant demonſtranda.

EXEMPLVM.

SIt artificialis dimidii ſinus totius (per 51) *6931469*, ſitque arcus totalis *69* graduum & 20 minutorum, cuius artificialis ſit 665143 datus: totalis arcus dimidium eſt 34 graduum & 40 minutorum, huius artificialem quæro. Complementum huius dimidij arcus eſt 55 graduum, & 20 minutorum, cuius artificialis ſit 1954370 datus : Addo itaque *6931469* ad *665143*, & fiet aggregatum 7596612 : ex quo aufero 1954370, & relinquentur 5642242 artificialis quæſitus, arcus 34 graduum & 40 minutorum.

58. *Datis artificialibus omnium arcuum non minorum 45 gradibus, omnium arcuum minorum artificiales facillimè habentur.*

Ex artificialibus arcuum omnium non minorum 45 gradibus per hypotheſin datis, habebis per præmiſſam, artificiales reliquorum omnium arcuum decreſcentium vſque ad vigeſimum ſecundum gradum cum ſemiſſe. Ex quibus iam habitis, artificiales ſimiliter reliquorum arcuum vſque ad 11 gradus & 15 minuta habebuntur. Et ex his rurſus, artificiales omnium arcuum vſque ad 5 gradus & 38 minuta. Et ita deinceps in primum vſque ad minutum.

59. *Tabulam Artificialem condere.*

Paginæ præparentur quadraginta quinque longiuſculæ, vt præter margines ſuperiorem & inferiorem, ſexaginta etiam lineas numerales capere valeant. Paginarum quælibet lineamentis tranſuerſis in 20 ſpatia æqualia diuidatur : ſpatiorum quoduis tres lineas numerales capere valeat. Inde aliis lineis deſcendentibus diuidatur pagina quæuis in columnas ſeptem, interpoſita duplici linea inter columnas ſecundam & tertiam, & inter quintam & ſextam : inter cæteras verò ſimplex ponatur linea. Prima pagina in fronte ſuperiore læuorſum, ſupra tres primas columnas ſuperſcribatur hoc titulo | O *Gradu* | & ſuperſcribatur inferiùs & dextrorſum

ſub

sub tribus vltimis colũnis sic | 89 *Gradus* | Secunda pagina superscribatur læuorsum sic | 1 *Gradus* | & subscribatur dextrorsum sic | 88 *Gradus* | Tertia pag. superscribatur sic | 2 *Gradus* | & subscribatur sic | 87 *Gradus* | Et ita cũ cæteris paginis procedendo, vt suprà scripti infrà scriptis additi, quad. antẽ vno minus siue 89 gradus semper compleant. Inde prima columna per singulas paginas titulum hunc suprascriptum habeat | *Minuta graduum suprascriptorum* | Secunda columna hoc titulo superscribatur | *Sinus arcuum sinistrorum* | Tertia columna hoc titulo superscribatur | *Artificiales arcuum sinistrorum* | Quarta columna hoc titulo & superscribatur & subscribatur | *Differentia inter artificiales complementorum* | Quinta columna subscribatur hac subscriptione | *Artificiales arcuum dextrorum* | Sexta columna subscribatur hac subscriptione | *Sinus arcuum dextrorum* | Septima columna subscribatur hac subscriptione | *Minuta graduum infra scriptorum* | Primæ deinde columnæ inserantur numeri minutorum ab o ad 60 progrediendo. Septimæ etiã columnæ inserantur numeri minutorum à 60 ad o decrescendo: ea lege, ut primæ & septimæ columnæ bina quæuis minuta in eadem linea opposita, gradum integrum seu 60 minuta perficiant. Exempli gratia, o ad 60, & 1 ad 59, & 2 ad 58, & 3 ad 57, &c. opponantur. Atque inter bina quæque viginti lineamentorum transuersorum, tres numeri in quolibet interuallo cujuslibet columnæ contineantur. In secunda columna ponantur numeri sinuum, respondentium gradibus suprà, & minutis à latere læuorsum in eadem linea positis. In sexta etiam columna ponantur numeri sinuum, respondentium gradibus infrà, & minutis à latere dextrorsum in eadem linea positis. Hos sinus suppeditabit tibi communis sinuum REINHOLDI Tabula, vel si qua exactior. His peractis, omnium sinuum inter sinum totum & suum dimidium, artificiales per 49 & 50: cæterorum verò sinuum artificiales per 54 computato. Siue aliter, multoque & exactiùs & faciliùs, omnium sinuum inter sinum totum & sinum 45 graduum artificiales, per easdem 49 & 50 computato: ex quibus jam habitis, omnes reliquorum arcuum minorum 45 gradibus artificiales, per

præmiſſam quàm facillimè acquires. Quibus omnibus artificialibus vtcunque computatis, in tertia columna locabis artificiales numeros reſpondentes gradibus ſuprà, & minutiis à latere ſiniſtro, ſuiſque ſinibus læuorſum in eadem linea poſitis. Similiter & in quinta columna locabis numeros artificiales reſpondentes gradibus infrà, & minutiis à latere dextro, ſuiſque ſinibus dextrorſum in eadem linea poſitis. Media tandem columna ſic perficitur: numerum quemque artificialem dextrum, ex artificiali ſiniſtrorſum in eadem linea poſito aufer, notatâ differentiâ in eadem linea interutrumque, donec totam mediam columnam compleueris, Hanc Tabulam nos ad ſingula minuta computauimus, atque eruditis (quibus plus ſit otii) eius exactiorem elimationem, vt & Tabulæ ſinuum emendationem relinquimus.

Epitome Tabulæ artificialis aliter condendæ.

60. QVI A nonnunquam *artificiales per 54 inuenti, differunt ab artificialibus per 58 inuentis; vt hujus ſinus 378064, numerus artificialis per illam eſt 3275276, per hanc verò eſt 3275274I arguitur quibaſdam in locis Tabula ſinuum vitioſa eſſe. Quapropter conſulo eruditis (quibus forſan diſcipulorum & computiſtarum copia ſit) vt Tabulam ſinuum exactiorem & maioris numeri edant, vtpote cuius ſinus totus ſit 100000000, ſcilicet octo cyphrarum præter vnitatis figuram, cùm prior ſinus totus ſeptem tantum conſtet. Deinde vt Tabula noſtra prima contineat centum numeros, progredientes in ea proportione, quæ eſt inter hunc nouum ſinum totum, & ſinum eo minorem vnitate, vtpote inter* 100000000, *&* 99999999.

Secunda Tabula contineat etiam centum numeros, in ea proportione, quæ eſt inter hunc nouum ſinum totum, & numerum eo minorem centenario, ſcilicet inter 100000000, *&* 99999900.

Tertia Tabula quæ & radicalis dicitur, triginta quinque columnas, & centum numeros in qualibet columna continet. Centum numeri

numeri eiusdem columnæ progrediantur in ea proportione, quæ est decem millium, ad numerum eo minorem vnitate, videlicet 1000-00000 *ad* 99990000. *Triginta quinque primi inter se, aut secundi, aut tertii, aut cæteri eiusdem ordinis omnium columnarum inter se progrediuntur ea proportione, quæ est* 100 *ad* 99, *aut sinus totius* 100000000 *ad* 99000000. *In his suisque artificialibus inueniendis & continuandis, obseruentur regulæ cæteræ præcedentes. Atque ex completa sic radicali Tabula, omnium sinuum inter sinum totum & sinum* 45 *graduum artificiales, exactissimè per* 49 *&* 50 *reperies: atque ex artificiali arcus* 45 *graduum duplato, habebis artificialem dimidii sinus totius per* 56. *Et tandem ex his iam habitis, cæteros artificiales per penultimè præcedentem exquires; quos in ordinem Tabulæ per præcedentem rediges, & fiet Tabula, omnium certè Mathematicarum Tabularum præstantissima & ad vsus præclarissimos parata.*

Finis constructionis Tabulæ Artificialis.

APPENDIX

DE ALIA EAQVE PRÆSTANTIORE LOGARITHMORVM *specie construenda;* *in qua* scilicet, vnitatis Logarithmus est 0.

INTER *varios* Logarithmorum *progressus, is est præstantior, qui cyphram pro* Logarithmo *vnitatis statuit, &* 10,000,000,000 *pro* Logarithmo *denarij seu decupli instituit: cæterorum autem omnium* Logarithmi, *ex his stabilitis necessariò consequentur, & modus inueniendi eos varius est, quorum primus sic se habet.*

LOGARITHMVM *decupli datum, videlicet* 10,000,000,000, *decies partire per quinque; & fient inde numeri sequentes* 2000000000, 400000000, 80000000, 16000000, 3200000, 640000, 128000, 25600, 5120, 1024. *Horum vltimum decies etiam bipartire, & fient inde numeri sequentes* 512, 256, 128, 64, 32, 16, 8, 4, 2. 1. *Atque hi omnes numeri sunt* Logarithmi. *Quæramus igitur singulorum numeros vulgares, qui eis ordine respondent. Inter denarium ergo seu decuplum* 10 *atque vnitatem (auctos calculi gratia quotuis cyphris, vtpote duodenis) capiantur quatuor media proportionalia, seu potius (per extractionem radicis supersolidæ) eorundem minimum, quod sit doctrinæ gratia* A. *Inter* A *& vnitatem, capiatur similiter ex quatuor proportionalibus minimum medium, quod sit* B. *Inter* B *& vnitatem, capiatur medium*

quartum

quartum seu minimum, quod sit C. *Et ita progredere per extractionem supersolidæ radicis, diuidendo interuallum inter recens inuentum & vnitatem, in quinque interualla proportionalia seu in quatuor media; quorum omnium quartum seu minimum semper notetur, vsque dum ad decimum medium minimum perueneris, quæ his notis signentur* D,E,F,G,H,I,K. *Computatis iam exactè hisce proportionalibus, perge, & inter* K *& vnitatem quære medium proportionale, quod sit* L. *Sic inter* L *& vnitatem cape medium proportionale, quod sit* M. *Sic simile medium inter* M *& vnitatem, quod sit* N. *Eodem artificio (per extractionem quadratam) creentur inter quemque recentem numerum & vnitatem, reliqua intermedia proportionalia, his notis signandá* O,P,Q,R, S, T, V: *Quorum proportionalium cuilibet, respondet ordine suus* Logarithmus *superioris seriei. Vnde vnitas erit* Logarithmus *numeri* V, *quicunque is fuerit, & 2 erit* Logarithmus *numeri* T, *&* 4. *numeri* S, *& 8 numeri* R, *16 numeri* Q, *32 numeri* P, *64 numeri* O, 128 *numeri* N, 256 *numeri* M, 512 *numeri* L, 1024 *numeri* K: *Quæ omnia ex superiore constructione patent. Ex his autem iam constructis, construi possunt aliorum tum* Logarithmorum *proportionalia, tum proportionalium* Logarithmi. *Nam sicuti in staticis ex additione ponderum vnitatis, binarij, quaternarij,* 8rij, *& aliorum pariter parium numerorum, omnis creari potest ponderum numerus, qui apud nos iam* Logarithmi *sunt: Ita ex proportionalibus* V,T,S,R, *&c. quæ illis respondent, & ex cæteris etiam duplicata ratione creandis, constitui possunt omnium* Logarithmorum *oblatorum respondentia proportionalia, per eorundem inuicem multiplicationem respectiuè, vt docebit experientia. Huius autem operis præcipua difficultas est in denis proportionalibus duodecim figurarum è sexaginta figuris supersolido more extrahendis: sed quanto maior hæc difficultas, tanto exactior est hic modus in* Logarithmis *proportionalium, &* Logarithmorum *proportionalibus inueniendis.*

Alius modus facilè creandi LOGARITHMOS numerorum compositorum, ex datis LOGARITHMIS suorum primorum.

SI *duo numeri datorum* Logarithmorum, *inuicem multiplicati componunt tertium*; *eorum* Logarithmorum *aggregatum erit tertij* Logarithmus.

Item si numerus per numerum diuisus producit tertium, è primi Logarithmo *secundi substractus, relinquit tertij* Logarithmum.

Si ex numero in se quadratè, cubicè, supersolidè, &c. ducto, producitur alter quiuis, ex primi Logarithmo *duplato, triplato, aut quintuplato, producitur illius alterius* Logarithmus.

Item si ex dato per extractionem quadratam, cubicam, supersolidam, &c. extrahatur radix, datique Logarithmus *bisecetur, trisecetur, aut per quinque secetur, producetur* Logarithmus *eiusdem radicis.*

Denique quicunque numerus vulgaris ex vulgaribus componitur per multiplicationem, diuisionem, aut extractionem: eius Logarithmus *componitur respectiuè per additionem, substractionem, duplationem, seu triplationem, &c. suorum* Logarithmorum. *Vnde sola difficultas est in numerorum primorum* Logarithmis *inueniendis, qui hac sequenti arte generali inueniuntur.*

Ad omnes Logarithmos *inueniendos, oportet duorum aliquorum vulgarium numerorum* Logarithmos *dari, aut saltem assumi pro fundamento operis, vt in superiore prima constructione,* o *seu cyphra assumebatur pro* Logarithmo *vulgaris vnitatis, &* 10,000,000 000 *pro* Logarithmo *denarii seu* 10. *His itaque datis, quaratur quinarii (qui primus numerus est)* Logarithmus *hoc modo. Inter* 10 *&* 1 *quaratur medium*

propor-

proportionale, quod est $\frac{316227766017}{100000000000}$. *Sic inter* 10,000,000,000 *&* 0 *queratur medium Arithmeticum, quod est* 5,000,000,000. *Deinde inter* 10 *&* $\frac{316227766017}{100000000000}$ *capiatur medium Geometricum quod est* $\frac{562341325191}{100000000000}$ *Et similiter inter* 5,000,000,000 *&* 0 *capiatur medium Arithmeticum, quod est* 7500000000.

In continuè proportionalibus vniuersis.

VT summa mediorum & alterutrius extremi, ad eundem extremum; sic differentia extremorum, ad differentiam extremi eiusdem & medii proximi.

Compendium dimidii Tabulæ LOGARITHMORVM.

DVorum arcuum quadrantem complentium, vt sinus maioris, ad sinum dupli arcus; Ita sinus 30 *graduum, ad sinum minoris. Vnde addito* Logarithmo *dupli arcus ad* Logarithmorum 30 *graduum; & à producto, subducto* Logarithmo *maioris, relinquitur* Logarithmus *minoris.*

Habitudines LOGARITHMORVM & suorum naturalium numerorum inuicem.

1. *DEntur duo sinus & sui* Logarithmi. *Si totidem numeri æquales sinui minori in se ducantur, quot sunt vnitates in maioris* Logarithmo; *& contrà, totidem æquales sinui maiori in se ducantur, quot sunt vnitates in minoris* Logarithmo;

mo; *erunt duo producta æqualia, & producti sinus* Logarithmus, *erit numerus factus ex ambobus* Logarithmis *inuicem multiplicatis.*

2. *Vt sinus maior ad minorem; Ita velocitas incrementi, aut decrementi* Logarithmorum *apud minorem, ad velocitatem incrementi aut decrementi* Logarithmorum *apud maiorem.*

3. *Duo sinus in ratione duplicata, triplicata, quadruplicata, &c. habent suos* Logarithmos *in ratione dupla, tripla, quadrupla, &c.*

4. *Et duo sinus in ratione vt ordo ad ordinem, (id est vt triplicatum ad quintuplicatum, vel cubus ad supersolidum) habent suos* Logarithmos, *in ratione vt eorundem ordinum indices, id est, vt 3 ad 5.*

5. *Si primus sinus in secundum ductus producit tertium*, Logarithmus *primi additus secundi* Logarithmo *producit tertii* Logarithmum. *Sic in diuisione, diuisoris* Logarithmus *ex diuidendi* Logarithmo *subductus, relinquit quotientis* Logarithmum.

6. *Et si quot æquales primo, inuicem ducti producunt secundum, totidem æquales primi* Logarithmo, *simul additi producunt* Logarithmum *secundi.*

7. *Medium quoduis Geometricum inter duos sinus, habet suum* Logarithmum *medium tale Arithmeticum inter sinuum* Logarithmos.

8. *Sinus primus diuidit tertium, quoties sunt vnitates in* A; *numerus secundus diuidit eundem tertium, quoties sunt vnitates in* B. *Item idem primus diuidit quartum, quoties sunt vnitates in* C; *& idem secundus diuidit eundem quartum, quoties sunt vnitates in* D. *Dico, quæ est ratio* A *ad* B, *eadem est* C *ad* D, *&* Logarithmi *secundi ad* Logarithmum *primi.*

9. *Hinc fit quod numeri oblati* Logarithmus, *est numerus locorum seu figurarum quas comprehendit factum ex oblato toties in se ducto quoties sunt vnitates in* 10,000,000,000.

10. *Item si index ordinis sit* Logarithmus *denarii, numerus figurarum (vna dempta) ordinis scilicet multipli. erit* Logarithmus *radicis.*

Quæritur, quis numerus sit LOGARITHMVS binarii. Respon-

Respondeo, numerus locorum numeri facti ex 10, 000, 000, 000 binariis inuicem ductis.

At dices, hic numerus factus ex 10,000,000, 000 binariis inuicem ductis est innumerabilis. Respondeo, numerus tamen locorum eius (quem quæro) est numerabilis. Ex data itaque radice (binario) & indice (10,000,000, 000) quære numerum locorum multipli, & non numerum ipsius multipli; & per regulam nostram inuenies 301029995 &c. pro numero locorum quæsito, & LOGARITHMO binarii.

FINIS.

LVCVBRATIONES ALIQVOT DOCTISSIMI D. HENRICI BRIGGII

In APPENDICEM præmissam.

Habitudines LOGARITHMORVM & suorum naturalium *numerorum inuicem; Si vnitatis* LOGARITHMVS sit o.

DATIS *duobus numeris cum suis* Logarithmis, *si communis aliquis diuisor vtrosque* Logarithmos *diuiserit, & vterque numerorum datorum toties in seipsum ducatur, vt numerus factorum ab alterutro, vnitate tantum superetur à quoto alterno* Logarithmi, *erunt duo producti æquales. Et* Logarithmus *numeri producti, erit numerus continuè factus, à quotis* Logarithmorum *& communi eorundem diuisore.*

		Logarithmi,
Sunto dati numeri	2511886$\frac{5}{}$	4
	3981071$\frac{8}{}$	6

Sit communis diuisor vnitas,

Primus in seipsum quinquies }
Secundus in seipsum ter--- } ductus facit $\frac{251188649}{1000000}$

Loga-

Continuè proportionales				Logarithmi.
	1	(0)		0
	25118865	(1)	Latus	4
	63095737	(2)	Quadratus	8
	158489331	(3)	Cubus	12
	39810718	(4)	Biquadratus	16
	100000000	(5)	Solidus	20
	251188649	(6)	Quadr. cubus	24

Continuè proportionales			Logarithmi.
	1	(0)	0
	39810718	(1)	6
	158489331	(2)	12
	630957379	(3)	18
	251188649	(4)	24

ALIVD EXEMPLVM.

		Logarithmi.
Sunto dati numeri	316227766	5
	50118724	7

Communis Logarithmorum diuisor sit 1

Primus sexies / Secundus quater } in seipsum ductus facit { 316227766

		Logarith.				Log.
1	(0)	0		1	(0)	0
316227766	(1)	5		50118724	(1)	7
1000000000	(2)	10		251188649	(2)	14
100	(4)	20		630957376	(4)	28
1000	(6)	30		316227766	(5)	35
316227366	(7)	35				

Notandum si communis diuisor sit vnitas, vt in vtroque exemplo præcedente; factus ab ipsis datis Logarithmus, *est* Logarithmus *numeri producti. Quia vnitas multiplicans non auget multiplicatum.*

TERTIVM EXEMPLVM.

		Logarithmi.	Quoti.
Sunto dati numeri	343	2.53529412	3
	823543	5.91568628	7
Sit communis diuisor		84509804	

Notandum numerus.			
	1	(0)	0
3	343	(1)	2.53529412
6	117649	(2)	5.07058824
8	40353607	(3)	7.60588236
11	3841287201	(4)	10.14117648
18	558545864083284007	(7)	17.74705884
6	823543	(1)	5.91568628
12	678223072849	(2)	11.83137256
18	558545864083284007	(3)	17.74705884

Datorum LOGARITHMORVM quoti sunt 3. 7. factus ab iis 21. qui ductus in communem diuisorem 84509804

84509804 facit 17.74705884 LOGARITHMUM numeri producti.

Notandum quod Cubus secundi numeri, eique æqualis septimus figuratus primi; (quem aliqui appellant secundum solidum) scribitur notis octodecim: idcirco eius Logarithmus *in fronte gerit 17. præter notas subsequentes, quæ exprimunt* Logarithmum *numeri, qui iisdem notis scribitur: sed eius prima tantum nota versus sinistram, denotat nobis integras vnitates quinque, reliquæ notæ subsequentes, exprimunt partes, integris hisce adiiciendas.* Sic $5\frac{5154586408}{10000000000}$, *&c. cuius* Logarithmus 74705884.

Quod si quatuor loci relinquantur integris, ponenda tria in fronte Logarithmi, *nota 3.* Sic $5585\frac{4586408}{10000000}$, *&c. cuius* Logarithmus 3.74705884.

Hinc poterimus datis duobus LOGARITHMIS *& sinu primi, inuenire sinum secundi.*

Sumatur *communis aliquis* Logarithmorum *diuisor (qui quò maior fuerit eò commodior erit) is diuidat vtrumque: deinde primus sinus seipsum multiplicet, & suos factos: donec numerus factorum vnitate tantum superetur à quoto secundi* Logarithmi *: vel donec procreetur figuratus, cognominis quoto secundi* Logarithmi. *Idem numerus produceretur, si secundus sinus quæsitus, seipsum multiplicaret, donec fieret figuratus, cognominis quoto primi* Logarithmi. *Vt patet per præcedentem propositionem. Huius itaque figurati, à primi quoto denominati latus quæratur: quod, vbi inuentum fuerit, erit sinus secundus quæsitus. Eritque continuè factus à quotis, & communi diuisore, ipsius figurati* Logarithmus.

Vt sunto dati LOGARITHMI 8. 14, & sit sinus primi 3 communis LOGARITHMORVM diuisor est 2, qui dat quotos 4. 7. Si 3 seipsum sexies multiplicet, proueniet 2187, pro figurato, qui in serie continuè proportionalium ab vnitate, septimum locum occupabit? & inde dici poterit non

incommodè ſeptimus figuratus. Idem numerus 2187, in alia continuè proportionalium ſerie, eſt ab vnitate figuratus quartus: cuius latus $6\frac{838521}{1000000}$ eſt ſinus ſecundus quæſitus.

Quoti 4 7. factus ab iis 28. qui ductus in communem diuiſorem 2 facit 56. LOGARITHMVM figurati 2187.

			Logar.
Continuè proportionales	1	(0)	0
	3	(1)	8
	9	(2)	16
	27	(3)	24
	81	(4)	32
	243	(5)	40
	729	(6)	48
	2187	(7)	56

		Log.
1	(0)	0
$\frac{6838521}{}$	(1)	14
$\frac{46765372}{}$	(2)	28
$\frac{31980598}{}$	(3)	42
2187	(4)	56

Notandum hos Logarithmos *diuerſos eſſe ab iis, qui ad illuſtrationem ſuperioris Propoſitionis adhibebantur? in hoc autem conueniunt, quod vtrobique* Logarithmus *vnitatis eſt* 0. *quo poſito,* Logarithmi *eorundem numerorum vel ſunt æquales, vel ſaltem proportionales inter ſe.*

Sinus primus diuidit tertium) debet primus diuidere tertium, & tertii quotum, & quoti deinceps quotum quemlibet, quoties poterit, donec quotus vltimus ſit minor diuiſore. Deinde diuiſionum harum numerus notetur, non autem quoti alicuius quantitas, (niſi fortè minimi, de quo mox plura diſcemus) eodem modo ſecundus, eundem tertium eiuſque quotos diuidat. Ita etiam diuidatur ab vtroque quartus. Vt

Sunto ſinus	primus	2
	ſecundus	4
	tertius	16
	quartus	64

Primus 2, diuidit tertium 16, quater. Suntque quoti 8. 4. 2. 1. *Secundus* 4, *diuidit eundem tertium* 16. *his. Suntque quoti* 4. 1. *erunt igitur*, A, 4. B, 2.

Eodem modo primus 2, *diuidit quartum* 64, *sexies. Quotique sunt* 32. 16. 8. 4. 2. 1.

Secundus 4, *diuidit quartum* 64, *ter. Quotique sunt* 16. 4. 1. *Sunt igitur* C, 6. D, 3. *aio vt* A, 4. *ad* B, 2: *sic* C, 6. *ad* D, 3. *& sic* Logarithmus *secundi, ad* Logarithmum *primi.*

Si in hisce diuisionibus, vltimus & minimus quotus vbique sit vnitas, vt in istis quatuor propositis: erunt numeri quotorum, & Logarithmi *diuisorum, reciprocè proportionales. Aliàs ratio non erit prorsus eadem vtrobique: veruntamen si diuisores fuerint exigui & diuidendi satis magni, ita vt quoti sint plurimi; defectus iste proportionalium, vix aut ne vix quidem percipi poterit.*

Hinc fit quod numeri oblati Logarithmus.

Sumantur duo numeri 10. & 2, *vel quiuis alius; & sit* Logarithmus *primi datus, scilicet* 100, *quæritur* Logarithmus *secundi, Primò, secundus seipsum toties multiplicet, vt numerus factorum, vnitate tantum superetur, à dato primi* Logarithmo. *Deinde vltimus factus, diuidatur per primum numerum* 10, *quoties fieri poterit; & eodem modo per secundum. Erit autem numerus quotorum, facti à secundo diuisi,* 100. *(quia factus iste est figuratus centesimus. Et si numerus aliquoties in seipsum ductus, faciet aliquem: idem numerus factum toties diuidet, & semel vlterius. vt 3 in seipsum quater ductus, facit 243. idem 3, diuidit 243 quinquies, & quoti erunt* 81. 27. 9. 3. 1.) *Deinde si idem factus diuidatur à primo* 10, *manifestum est, numerum quotorum, vnitate tantum minorem esse numero locorum in diuiso. Idcircò cùm idem factus diuidatur à datis duobus numeris, quoties fieri potest? erunt (per præcedentem propositionem) numeri quotorum, &* Logarithmi *diuisorum, reciprocè proportionales. Est autem numerus quotorum secundi, æqualis* Logarithmo *primi: idcircò numerus quotorum primi (id est numerus locorum in facto, vno dempto,) æquabitur* Logarithmo *secundi.*

NVMERI

NVMERI LOCORVM SEV NOTARVM.		
	1	1.
1	2	
1	4	2
2	16	4
3	256	8
4	1024	10
7	1048576	20
13	1099511627776	40
25	1208925819614	80
31	1267650600228	100
61	16069379676	200
121	25822496318	400
241	66680131608	800
302	107150835165	1000
603	114813014767	2000
1205	131820283599	4000
2409	17316587168	8000
3011	19950583591	10000

Hîc videmus, LOGARITHMVS denarii sit 10, notæ seu loci in decimo figurato sunt quatuor. Idcirco LOGARITHMVS binarii erit 3 & ampliùs. In centensimo figurato numerus notarum est 31: in millesimo, 302: in 10000, 3011; & quò plures fuerint facti, eò propiùs acceditur ad verum LOGARITHMVM quæsitum: in minoribus enim factis partes vltimo quoto adhærescentes rationes perturbant aliquantulum. Verùm si ponatur LOGARITHMVS denarii, esse 10,000,000,000; Et binarius in seipsum toties ducatur, vt

vt factorum numerus, vnitate tantum ſuperetur â dato LOGARITHMO; erit numerus locorum in vltimo facto deamptâ vnitate, LOGARITHMVS binarii ſatis accuratus; quia particulæ vltimo quoto adjectæ, in numeris adeò magnis, fruſtra conabatur proportionem impedire.

FINIS.

PROPOSITIONES QVÆDAM EMINENTISSIMÆ AD TRIANGVLA ſphærica, mirâ *facilitate reſoluenda.*

Triangulum ſphæricum reſoluere, abſque eiuſdem diuiſione in duo quadrantalia aut rectangula.

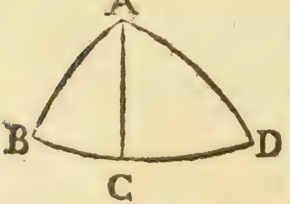
PROPOSITIO PRIMA.

DATIS *tribus lateribus, angulum quemuis propalare. Et contrà.*

Prop. 2. *Ex tribus datis angulis latus quoduis inuenire.*

Perficitur hoc omnium optimè, per tres modos LOGARITHMORVM noſtrorum, *Cap.6. Sect.* 8ª. 9ª. 10ª. deſcriptos.

3. *Datis latere* A D, *& angulis* D *&* B, *latus* A B *inueſtigare.*



Duc ſinum A D in ſinum D, productum diuide per ſinum B, & proueniet ſinus A B.

4. *Datis latere* A D, *& angulis* D *&* B, *latus* B D *acquirere.*

Duc ſinum totum in ſinum complementi D, & diuide per tangentem complementi A D, & fiet tangens C D arcus: deinde

deinde duc ſinum C D, per tangentem D, & diuide productum per tangentem anguli B, & fit ſinus B C; adde aut ſubſtrahe B C & C D, & fit B D.

5. *Datis latere* A D, *& angulis* D *&* B, *angulum* A *inuenire.*

Duc ſinum totum in ſinum complementi A D, & diuide per tangentem complementi D anguli, & prouenict tangens complementi C A D; & ſic habetur ipſe C A D angulus. Similiter duc ſinum complementi B anguli, per ſinum C A D, & diuide per ſinum complementi D, & fit ſinus anguli B A C; quo addito vel ſubſtracto ex C A D proueniet B A D quæſitus.

6. *Datis* A D, *&* D *angulo cum latere* B D, *inuenire angulum* B.

Duc ſinum totum in ſinum complementi D. & diuide per tangentem complementi A D, & fiet tangens C D; cuius arcum C D aufer (vel aliàs adde) à latere B D, & fit B C. deinde duc ſinum C D, per tangentem D, & diuide productum per ſinum B C, & fit tangens anguli B.

7. *Datis* A D, *&* D *angulo cum latere* B D, *inuenire latus* A B.

Duc ſinum totum in ſinum complementi D, & diuide productum per tangentem complementi A D, & fiet tangens C D: cuius arcum C D, aufert vel adde lateri B D dato, & fit B C. Deinde duc ſinum complementi A D, per ſinum complementi B C, productum diuide per ſinum complementi C D, & proueniet ſinus complementi A B: & ita ipſe A B habetur.

Sequi videtur, ex A D & D angulo cum latere B D datis, inuenire angulum A ſeu B A D: ſed hic ſitus triplicem requireret Regulam TRIUM. Mutato igitur A pro B, & B pro A, erit problema ſic. *Datis* B D *&* D, *cum latere* A D, *inuenire angulum* B. Quod prorſus idem eſt cum ſeptimo problemate, & duplici tantum regula Trium expeditur.

8. *Datis* A D *& angulo* D, *& latere* A B, *angulum* B *inuenire.*

Duc ſinum A D in ſinum D, & productum diuide per ſinum A B, & producitur ſinus anguli B.

9. *Datis* A D, *& angulo* D, *& latere* A B, *latus* B D, *inuenire.*

Duc ſinum totum in ſinum complementi D, & diuide productum per tangentem complementi A D, & fiet tangens C D arcus. Deinde duc ſinum complementi C D, in ſinum complementi A B, & productum partire per ſinum complementi A D, & proueniet ſinus complementi B C. Ipſiuſmet ergo B C & C D arcuum ſumma, vel differentia, eſt latus B D quæſitum.

10. *Datis* A D, *& angulo* D *cum latere* A B, *angulum* A *ſeu* B A D *inuenire.*

Duc ſinum totum in ſinum complementi A D, productum diuide per tangentem complementi D, & proueniet tanges complementi C A D; & ſic habetur ipſe C A D angulus. Deinde duc tangentem A D, per ſinum complementi anguli C A D, productum diuide per tangentem A B, & proueniet ſinus complementi B A C; & inde B A C ipſe: cuius, & C A D arcuum ſumma, vel differentia, eſt B A D angulus quæſitus.

11. *Datis* A D *angulo* D, *cum angulo*, A, *latus* A B *exquirere.*

Duc ſinum totum in ſinum complementi, A D, & diuide productum per tangentem complementi D anguli, & proueniet tangens complementi C A D, & ſic habetur ipſe C A D angulus: cuius, & integri anguli A differentia, (vel aliàs ſumma) eſt angulus B A C. Deinde duc tangentem A D, in ſinum complementi C A D, productum partire per ſinum complementi B A C, & proueniet inde tangens A B.

12. *Datis* A D *& angulo* D, *cum angulo* A, *angulum tertium* B *inuenire.*

Duc ſinum totum in ſinum complementi A D, & diuide productum per tangentem complementi anguli D, & proueniet ſinus complementi anguli B, & inde ipſe angulus B quæſitus.

Sequi videtur, ex A D, & D, & A angulis, inuenire B D latus: ſed in hoc ſitu triplicem requirit regulam Trium. Mutatis igitur A in D, & D in A, erit problema ſub hac forma.

Datis

Datis D A, *&* A, *&* D *angulis, inuenire* B A. Prorsus idem cum problemate 11. & duplici tantum Regula Trium expeditur.

De semi-sinuum versorum, præstantia & vsu.

1. DATIS *duobus lateribus & angulo intercepto, tertium latus inuenire.*

Semi-sinum versum differentiæ crurum, aufer ex semisinu verso aggregati crurum: reliquum multiplica per semisinum versum anguli verticalis intercepti: & producto diuiso per sinum totum, adde semi-sinum versum differentiæ crurum, & prodibit semi-sinus versus basis optatæ.

Eâdem ratione ex basi & angulis iuxta eam, reperitur tertius angulus verticalis.

2. *Contrà ex tribus lateribus inuenire angulum quemuis.*

Ex semi-sinu verso basis aufer semi-sinum versum differentiæ crurum in sinum totum ductum; reliquum diuide per semi-sinum versum aggregati crurum, minutum semisinu verso differentiæ crurum: & prodibit semi-sinus versus anguli verticalis quæsiti. Eâdem ratione ex tribus angulis inuestigantur latera.

3. *Datis duobus arcubus tertium dare, cuius sinus æquetur differentiæ sinuum priorum.*

Sit arcus 38 : 1′, eius Logarithmus 484504: arcus alter 77 gr. Horum accipe complementa 51 : 59′, & 13 gr. quorum semi-aggregatum est 32 : 29′, semi-differentia verò est 19 : 29′: quorum Logarithmi sunt 621656 & 1098914; quos adde, fient 1719670; à quo producto substrahe 693147, & remanebit 102623 Logarithmus 21 gr. vel idcirca. Dico sinum rectum 21 gr., qui est 358368, æqualem esse differentiæ sinuum arcuum 77, 38 : 1′; qui sinus sunt 974370, & 615891 plùs minùs.

4. *Dato arcu, dare Logarithmum eius sinus versi.*

Sit arcus 13 gr, cuius dimidium 6 : 30′; eius Logarithmus 2177570, cuius duplum est 4367140: à quo aufer 693147, & remanebit 3663993, cuius arcus est 1 : 28′, & numerus in-

ter sinus positus est 25595 : atque is est sinus versus quæsitus 13 gr.

5. *Datis duobus arcubus tertium dare, cuius sinus æquetur aggregato sinuum priorum arcuum.*

Sit vnus arcus 38 : 1', alter arcus 1 : 28': eorum aggregatum est 39 : 29', & eorum differentia est 36 : 33': semi-aggregatum autem est 19 : 44', semi-differentia verò est 18 : 16. Adde ergo Logarithmum semi-aggregati, qui est 1085655, ad Logarithmum differentiæ, qui est 518313, & fit productum 1603968 : à quo aufer Logarithmum semi-differentiæ, qui est 1160177, remanent 443791 Logarithmus : cui respondet arcus 39 : 56', sinus verò 641896. Qui quidem sinus æquatur vtriq; sinui 38 : 1', qui est 615661 : & sinui 1 : 28', qui est 25595 aut iuxtà.

6. *Dato arcu & Logarithmo sui sinus recti; arcum dare, cuius sinus versus sit priori sinui recto æqualis.*

Sit arcus 39:56, cui respondet Logarithmus 443791 (ignoto sinu recto,) Logarithmo 443791 adde Logarithmum 693147, fient 1136938. Logarithmum hunc bipartire, & fiet Logarithmus 568469 : cuius arcum 34 : 30' duplica, & fient inde 69 gr. arcus qui quærebatur. Dico enim quod sinus rectus 39 gr. & 56', est æqualis sinui verso 69 gr. : vterque enim sinus est 641800, aut propè.

7. *Trianguli Sphærici* A B D, *datis cruribus & angulo verticali; basin dare.*

SIT Triangulum Sphæricum A B D, detur angulus verticalis A, 120 gr. 24' 49'' : crus alterum ambientium detur 34, crus reliquum 47 gr. dimidium anguli verticalis 60 : 12' : 24, cuius Logarithmus 141766 : eius duplo 283533, adde Logarithmos crurum 581260 & 312858, fit summa 1177651 : qui est Logarithmus semi-differentiæ sinuum versorum basis & differentiæ crurum : atque idem est Logarithmus sinus recti 17 : 56'; quem arcum, inuentum secundum appellamus: est enim inuentum primum quod sequitur. Differentiam crurum 13 bipartire fient 6 : 30' : cuius Logarithmum 2178570 duplica, & fient 4357140 pro Logarithmo dimidii sinus versi 13 gr., & pro Logarithmo sinus recti 0 gr. 44' : quem arcum

44' pro

4:4 pro inuento primo habemus. Horum inuentorum aggregatum est 18 gr. 46, & eius Logarithmus est 1139241: semiaggregatum autem est 9 gr. 23, eius Logarithmus est 1819061: differétia verò est 17 gr. 12, & eius Logarithmus est 1218382, semi-differentia verò est 836, cuius Logarithmum 1900221. Adde ergo Logarithmum semi-aggregati 1819061,

Vel ad hunc Logarithmum 1218382, & fiet productum 3037443: à quo aufer Logarithmum 1900221, & remanebunt 1137222.

Vel ad anti-logarithmum semi-differentiæ, qui est 11307, fient 1830368: hinc substrahe 693147, & restabunt 1137221.

Hos bipartire, fient 568611, cuius Logarithmi arcus est 34:30, quem arcum duplica, & fiet basis quæsita 69 graduum.

Conuersum huius problematis, ad inueniendum angulum ex datis lateribus habetur lib. Logar. Cap. 6. Sect. 8. sed partim per Logarithmos, partim per arcuum prostaphæresin.

Notandum in præcedenti & sequentibus problematis nullà opus esse casuum obseruatione: specie enim omnium partium vnà cum quantitate, ex ipso calculo prodeunt.

Sequitur alia conuersio præcedentis directa.

DATAM basin 69 gr. bipartire, fiet 34:30, cuius Logarithmus est 568611: quem duplica fient 1137222; cuius arcum 18 gr. 42, pro inuento primo nota: superioris autem Logarithmi 4357140 arcum 0 gr. 44, pro inuento secundo nota. Horum arcuum complementa sunt 89:16, & 71:18: horum semi-aggregatum est 80:17, & eius Logarithmus 14449: semi-differentia verò 8:59, eiusq; Logarithmus 1856956: quos adde, fient 1871405: à quibus substrahe 693147, & relinquentur 1178258, cuius arcus est 17 gr. 56, quem arcum, inuentum tertium hic vocamus: à cuius Logarithmo aufer Logarithmos crurum 581260 & 312858, & relinquentur 283533, quem bipartire, fient 141766 Logarithmus semi-anguli verticalis 60:42:24½. Totus ergo angulus

angulus verticalis quæsitus est 120 : 24 : 49.

Regula alia prostaphæretica inuentionis basis.

SEmi-differẽtiam sinuum versorum aggregati & differentiæ crurum nota: Nota etiam semi-sinum versum anguli verticalis. Notatos hos inter sinus rectos quære, & semidifferentiam sinuum versorum aggregati & differentiæ suorum arcuum in Tabula occurrentium, pro inuento secundo signabis: & pro inuento primo capiatur semi-sinus versus differentiæ crurum. Hæc inuenta adde, & proueniet semisinus versus basis quæsitæ.

Contrà autem ex semi-sinu verso basis, aufer primum inuentum, quod est semi-sinus versus differentiæ crurum, & prodibit secundum inuentum; quod per quadratum sinus totius, ductum & diuisum per semi-differentiam sinuum versorum aggregati & differentiæ crurum, relinquit in quotiente semi-sinum versum anguli verticalis quæsiti.

Ex quinque partibus trianguli sphærici, quarum tres mediæ dantur, duas extremas vno opere inuenire. Aut aliàs, datis duobus angulis apud basin cum basi, vtrumque crus sic habetur.

(*) ANgulorum apud basin aggregatum, semi aggregatum, differentiam, & semi-differentiam, vnà cum suis Logarithmis nota. Inde Logarithmos semi-aggregati & differentiæ, & differentialem semi-basis adde: & hinc subducito Logarithmum aggregati, & Logarithmum semi-differentiæ; & producetur differentialis, qui est primum inuentum. Deinde Logarithmum semi-differentiæ, & differentialem semi-basis adde: hinc aufer Logarithmum, semi-aggregati, & producetur differentialis, qui est inuentum secundum inuentos hos differentiales, quia veri sunt, quære inter numeros differentiales: eorum arcus adde, & habebis crus maius; similiter minorem à maiore substrahe, & habebis crus minus.

Aliter pro cruribus inueniendis.

ANgulorum apud basin Logarithmum semi-aggregati, antilogarithmum semi-differentiæ, & differentialem semi-

ſemi baſis adde: & aufer Logarithmum aggregati & 693147, & fiet primum inuentum. Deinde Logarithmum ſemi-differentiæ, anti logarithmum, ſemi-aggregati, & differentialem ſemi baſis adde: & hinc aufer Logarithmum aggregati & 693147, & fiet inuentum ſecundum. Cum inuentis age vt ſuprà, & habebis crura.

Idem aliter.

SEcantem complementi aggregati angulorum apud baſin, duc per tangentem ſemi baſis: productum duc primò per ſinum anguli maioris apud baſin, & fit inuentum primum. Secundò duc per ſinum minoris anguli, & fit inuentum ſecundum. Hos ergo inuentos diuiſos per quadratum ſinus totius adde, & fit tangens ſemi-aggregati crurum: ſimiliter maiorem à minore ſubſtrahe, & fiet tangens ſemi-differentiæ crurum. Eorum ergo arcuum vtrumque adde, & fiet crus maius: ſimiliter minorem arcum à maiore aufer, & fiet crus minus.

Quinque partium proximarum Trianguli ſphærici datis tribus medijs, vtramque extremam vno opere, & abſque caſuum obſeruatione inquirere.

ANgulorum apud baſin, vt ſinus ſemi-differentiæ, ad ſinum ſemi aggregati: Ita ſinus differentiæ, ad quartum (*) quod eſt aggregatum ſinuum.

Et vt ſinus aggregati, ad hoc aggregatum ſinuum: Ita tangens ſemi baſis, ad tangentem ſemi-aggregati crurum.

Inde vt ſinus ſemi-aggregati angulorum, ad ſinum ſemi-differentiæ: Ita tangens ſemi-baſis, ad tangentem ſemi-differentiæ crurum.

Horum inuentorum tangentium arcus, è Tabula tangentium extractos adde, & prodibit crus maius; ſic minorem à maiore ſubſtrahe, & prodibit crus minus.

F I N I S.

ANNOTATIONES
ALIQVOT
DOCTISSIMI D. HENRICI BRIGGII
IN PROPOSITIONES PRÆMISSAS.

DATO *Arcu dare Logarithmum eius sinus versi*] *ad huius propositionis finem* *** *ego libenter adiicerem. Et contrà, Dato Logarithmo sinus versi, inuenire eius arcum.*

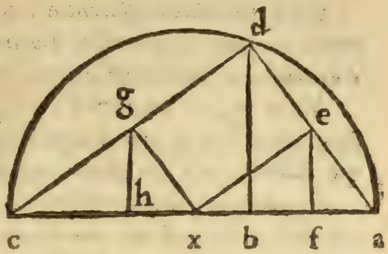
Logarithmo 30:6. 693147, *addatur Logarithmus datus sinus versi quæsiti: semissis totius, est Logarithmus dimidij arcus quæsiti.*

Vt sit Logarithmus datus 35791 sinus versi ignoti, cuius arcus etiam ignoratur: huic addatur 693147 summa erit 728938 cuius semissis 364469 est Logarithmus 43:59′:33″. est igitur datus Logarithmi arcus 87:59′:6″. cuius sinus versus 9648389.

Si datus fuerit Logarithmus defectiuus ---54321, & quæratur eius sinus versus: addatur vt anteà 693147. summa (id est numerus reliquus, quia signa sunt contraria) erit 638826, cuius semissis 319413, est Logarithmus 46:36′:0, qui duplicatus est 93:12:0, cuius sinus versus 10558216, cùm sit maior radio, habet Logarithmum defectiuum ---54321.

DEMONSTRATIO.

cb } ſinus verſi arcuum { cd
ab } { ad



xc } proport. xa } proport. ½ xc ſinus 30:6 } proport.
cg } ae } cg ſinus ½ arcus cd }
ch } af } cb dupla ch rectæ }

Tandem ſenſi ſextam propoſitionem ſequentem, hoc ipſum eodem prorſus modo præſtare.

Trianguli ſphærici A B D]

Alium modum pro inuentione baſis ſequi poſſumus ſic.

Si Logarithmus ſinus verſi, dati anguli, addatur Logarithmis crurum: ſumma erit Logarithmus differentiæ ſinuum verſorum, differentiæ crurum & baſis quæſitæ. Idcirco per Logarithmum inuentum, quæratur differentia ſinuum verſorum, huic differentiæ addatur ſinus verſus differentiæ crurum, ſumma erit ſinus verſus baſis quæſitæ.

Vt in hoc exemplo: Crura 34. 47, eorum Logarithmi 581261. 312858. Logarithmus ſinus verſi dati anguli defectiuus ---409615, qui additus ſuperioribus (quod fit per ſubductionem, quia ſigna ſunt contraria) dat 484504, Logarithmum differentiæ ſinuum verſorum baſis & differentiæ crurum.

Linea verò huic Logarithmo reſpondens, ſiue ſit ſinus verſus ſiue rectus, eſt 6160057, quæ eſt differentia ſinuum verſorum baſis & differentiæ crurum. Cui, ſi addatur ſinus verſus differentiæ crurum 0256300, ſumma 6416357 erit ſinus verſus baſis quæſitæ: qui ablatus è radio, relinquit 3583643 ſinum rectum complementi baſis 21:6. eſt igitur baſis 69:6.

Et contrà datis tribus lateribus, inuenitur angulus quilibet.

Si è Logarithmo differentiæ sinuum versorum, basis & differentiæ crurum, auferantur Logarithmi crurum, reliquus erit Logarithmus sinus versi anguli quæsiti.

Vt in priori exemplo è Logarithmo 484504 auferatur 894119 reliquus erit Logarithmus defectiuus -- 409615 qui dabit nobis sinum versum anguli quæsiti. 120 : 24′ : 49″.

Ex quinque partibus trianguli sphærici] Hæc propositio omnino eadem esse videtur cum vltima, quæ ad finem adiecta, eodem modo à me notatur sic (*) Hanc ego præstantissimam esse lubentissimè existimo. Sunt autem tres operationes, quæ in vltima magis sunt distinctæ, earum duas priores in vnam coniicio, sic.

Sunto data basis 69. 6.

Anguli ad basin { 42′ : 29′ : 59″ / 31 : 6′ 5′

73: 36: 4	summa
36: 48: 2	semi-summa
53: 11 : 58	comp. semisummæ
11: 23 : 54	differentia
5: 41: 57	semi-differentia
84: 18: 3	comp. ½ differentiæ

			Logarithmi
1. Prop.	Sinus semi-differentiæ	5: 41′: 57″	23095560
	Sinus semi-aggregati	36: 48′: 2″	5124410
	Sinus differentiæ	11: 23′: 54″	16213641
	Summa sinuum		---1757509
2. Prop.	Sinus aggregati	73: 36′: 4	415312
	Summa sinuum		---1757509
	Tangens semibasis	34: 30: 0	3750122
	Tang. ½ summæ crurum	40:30	1577301

			Logarithmi
3. Prop.	Sinus ½ aggregati angulorum	36:48′: 2″	5124410
	Sinus semi differétiæ angulorũ	5:41′:57″	23095560
	Tangens semi basis	34: 30′: 0″	3750122
	Tangens ½ differentiæ crurum	6: 30′: 0″	21721272

40:36
6:30

47 : 0 } crura.
34 : 0

Hæ sunt operationes ab authore traditæ. Ego verò, vnam pro duabus primis constituo, tertiam verò seruo.

			Logarithmi
Proport.	Sinus compl. ½ summæ angulorum	53:11:58	2222368
	Sin.comp. ½ differentiæ angulor.	84:18. 3	49553
	Tangens semibasis	34:30:0	3750122
	Tangens semisummæ crurum	40:30:0	1577307

ALIVD EXEMPLVM.

Sunto datus angulus 47:6.

Crura comprehendentia { 59:35:11 / 31:6:5

90:41:16 summa
45:20:38 semi summa
44:39:22 compl. semi-summæ

28:29:6 differentia
14:14:33 semi-differentia
75:45:27 com. semi-differentiæ

			Logar.
1.Prop.	Sinus compl. ½ summæ crurum	44:39:22	3526118
	Sinus compl ½ differentiæ cruru̅	75:45:27	312192
	Tangens compl. ½ anguli vertic.	66:30	-- 8328403
	Tang. ½ sum. angul. ad basim	72:30	-- 11452329

			Logar.
2.Prop.	Sinus semi-summæ laterum	45:20:38	3406418
	Sinus semi-differentiæ laterum	14:14:33	14023154
	Tangens com. semiang. vert.	66:30:0	-- 8328403
	Tang. semidiff. ang. ad basim	38:30	2288333

72 : 36
38 : 30

111 : 0 } Anguli ad basim
34 : 0 }

Atque hæc omnia constantissimè seruantur, siue dati fuerint duo anguli, cum latere interiecto: siue duo crura, cum angulo comprehenso. Hoc tantum interest, quod tertium proportionis locum, in vtraque operatione: illic, Tangens semibasis occupat: hic, Tangens compl. semissis anguli verticalis. In his exemplis, si Tangens vel summa sinuum, sit maior Radio circulari: Logarithmus est defectiuus, & habet virgulam præcedentem sic --- 8328403.

Idem aliter]

Hos ergo inuentos diuisos per quadratum sinus totius adde) *Ego sic potiùs scriberem, quò res esset manifestior.* Horum ergo inuentorum, per quadratum sinus totius diuisorum, quotos adde, & fiet Tangens, &c.

Hæc propositio verissima est, vt & proxime antecedens; sed illa per Logarithmos commodissimè expedietur, hæc tota, vix poterit Logarithmorum operationes admittere: quia quoti sunt addendi & auferendi, vt Tangentes inueniantur. Logarithmorum autem vsus cernitur in proportionalibus, & idcircò in multiplicatione & diuisione: non autem in additione aut subductione.

F I N I S.

Fxtraict du Priuilege du Roy.

SViuant le Priuilege & mandement de S. M. à tous Preuosts des terres de son obeyssance, & à tous ses amez Iusticiers & Officiers, & à chascun d'eux appartiendra, ainsi qu'il est permis à Barthelemy Vincent Marchand Libraire à Lyon, d'Imprimer vendre & debiter ledict Liure intitulé *Logarithmorum Canonis descriptio, seu Arithmeticarum supputationum mirabilis abbreuiatio. Eiusque vsus in vtraque Trigonometrica vt etiam in omni Logistica Mathematica, amplissimi, facillimi & expeditissimi explicatio. Authore ac Inuentore Ioanne Nepero: Barone Merchistonij, &c.* durant le temps & espace de neuf ans, à commencer du iour & datte de ladicte Impression paracheuee: auec deffences à toutes personnes de quelque estat, vacation & condition qu'ils soyent d'en vendre ou debiter, ny d'en estre saisi d'vn ou plusieurs exemplaires autres que de ceux imprimez par ledict Vincent, à peine de confiscation des exemplaires, & autres peines portees par iceluy, qui fust donné à Paris les iour, mois & an y contenu. Signé & deuëment seellé du grand seel de cire jaune.

Mirifici Logarithmorum, Acheué d'imprimer le 31. Mars 1620.

Napier invented the logarithms 1614.

2 works in 1

Vol I 3. ed

Vol II 2. ed (but 1. ed with annotations by H. Briggs)

6.800,– net